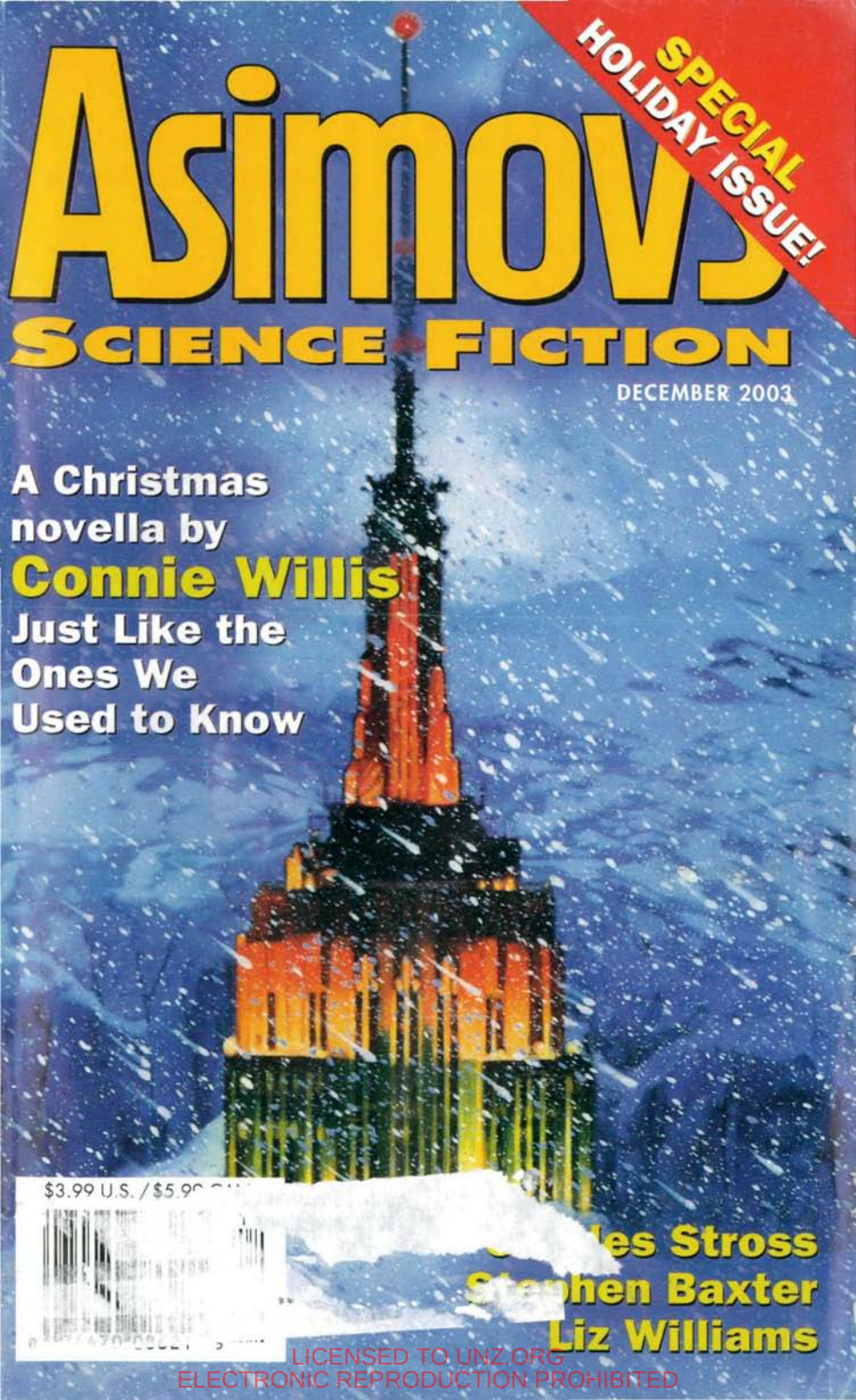

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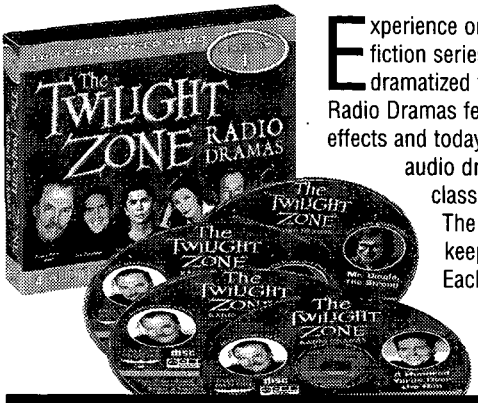

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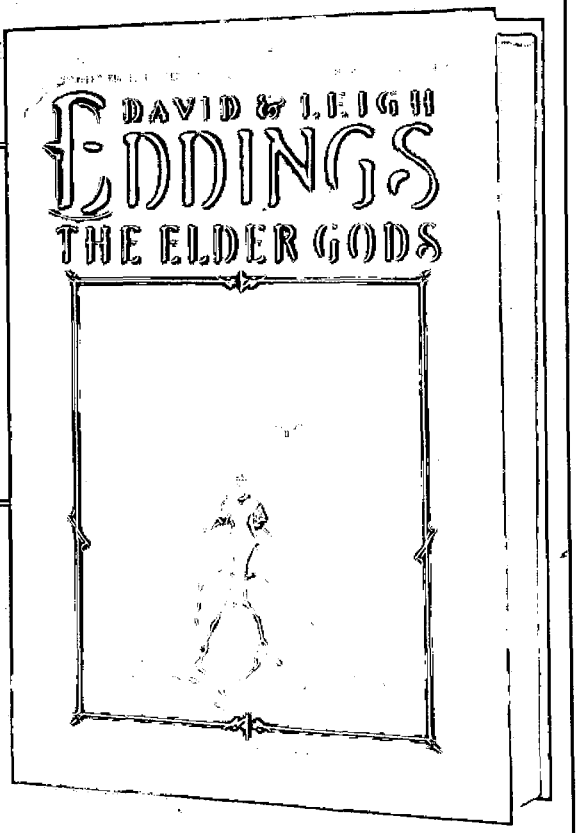

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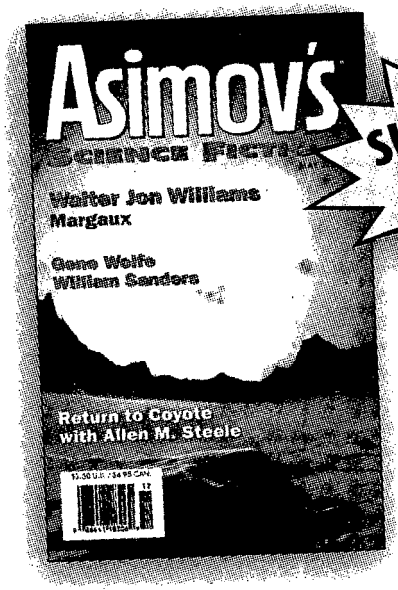

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REFLECTIONS by Robert Silverberg

HEART OF STONE

From the Cretaceous sandstone of South Dakota a decade ago came a flabbergasting find: the fossilized heart of a sixty-six-million-year-old dinosaur. Not only is this just the second time fossilized internal tissues of a dinosaur had been discovered (a specimen unearthed earlier in Italy yielded fossilized intestines), but the Dakota fossil appears to confirm the controversial theory that the dinosaurs, though reptiles, were, in fact, warm-blooded.

This particular dinosaur was a thirteen-foot-long six hundred and sixty pound herbivore of the genus Thescelosaurus. Its discoverer, a fossil-hunter named Michael Hammer, noticing a large mineralized lump within the creature's rib-cage, suspected that it might be one of the animal's internal organs. He asked an Oregon physician, Dr. Andrew Kuzmitz, to run a tomographic scan on it, and that indicated the presence of a heart, neatly encased within a stone sarcophagus.

The North Carolina Museum of Natural Sciences in Raleigh acquired the fossil in 1996 and launched a more elaborate study. Computerized three-dimensional pictures made by imaging specialists from the North Carolina State College of Veterinary Medicine led to the conclusion that the stone lump did indeed contain a heart, a four-chambered one, with an aorta-like struc-ture emerging from the left ventricle—thus providing the best evidence thus far for the warm-blooded-dinosaur theory.

Warm-bloodedness has been considered a biological advantage since Aristotle's time. He wrote, "The thicker and warmer the blood is, the more it makes for strength." Since cold-blooded creatures have no internal temperature-regulating devices, they become torpid as the air temperature around them drops, and below a certain critical level enter a state of dormancy. When warmth returns they become active again, but if the day grows too hot they are in danger of overheating, and must find cool hiding places. All of this limits their ability to gather food, their responsiveness to unexpected challenges, and their ability to adapt to environmental change.

The high-powered metabolism and greater adaptability of warm-blooded creatures permits far more strenuous functioning of heart, lungs, and muscle tissue. They are more versatile than cold-blooded ones in every way, which is why the forests, meadows, and deserts of the world swarm with mammals and birds, whereas amphibians and reptiles skulk in odd corners and fish are confined to the sea.

That the circulatory systems of dinosaurs might differ from those of modern reptiles is an old idea. The pioneering British paleontologist Richard Owen had by 1842 recognized that the pelvic structure of the giant beasts set them apart from living reptiles. Owen had no doubt that they were cold-blooded, but he did not see them

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just as oversized lizards or crocodiles with unusual pelvises. Their hearts, he argued, must have been of different design also.

Modern reptiles have three-chambered hearts: two atria, one for oxygenated blood coming from the lungs and the other to receive deoxygenated blood from the rest of the body, and a ventricle in which both streams of blood are mixed to be pumped forth again. This mixing reduces the efficiency of the animal's metabolism. Dinosaurs, Owen said, must have had a more "highly organized center of circulation" to operate their vast bodies, requiring hearts with two atria and two ventricles to avoid the mixing of stale blood with fresh.

Later scientists also found dinosaur metabolism puzzling. Frederic A. Lucas, in 1929, raised the issue of how dinosaurs, if they had been as sluggish as modern reptiles, could ever have managed to gather enough food to keep their enormous bodies functioning. Ultimately he fell back on the point that reptiles, precisely because they *are* sluggish cold-blooded creatures, need nowhere near the quantity of fuel required by mammals of the same mass. "Still," he added, "it is dangerous to lay down any hard and fast laws concerning animals . . . and in the present instance there is some reason, based on the arrangement of vertebrae and ribs, to suppose that the lungs of dinosaurs were somewhat like that of birds, and that, as a corollary, their blood may have been better aerated and warmer than that of living reptiles."

But no serious challenge to the classic view of dinosaurs as cold-blooded developed until 1964, when the Yale paleontologist John Ostrom discovered a mini-dinosaur he called *Deinonychus,* "terrible claw" —a fast-moving carnivore that weighed about 150 pounds and chased its prey on powerful hind limbs. Running in an upright position, Ostrom pointed out, requires a tremendous output of energy, incompatible with a cold-blooded metabolism. In today's world, the only animals that walk upright are warm-blooded ones, mammals and birds; reptiles and amphibians are waddlers and sprawlers. Yet here was the upright Deinonychus: how, Ostrom wondered, did it manage to keep itself on the move if it had had a reptilian metabolism? For that matter, where did the other, larger dinosaurs find the energy to pump blood from their hearts to brains that might be located twenty or thirty feet away?

Then the French anatomist Armand de Ricqles, examining thin sections of dinosaur bone, discovered them to be rich with canals that facilitate the passage of calcium from the blood to the skeleton. Contemporary reptile bone has no such canals, and Ricqles concluded that this "indicates rate of bone/body-fluid exchange at least close to those of large, living mammals."

Next Robert T. Bakker, a former pupil of Ostrom's, launched an all-out offensive in favor of saurian warm-bloodedness. Bakker studied the numerical predator/prey ratios in fossil beds where dinosaurs were found. Warm-blooded carnivores like lions and cheetahs must live among vast surrounding populations of herbivores to survive; otherwise their own voraciousness would cause them to consume their whole food supply. But large predatory reptiles like the Komodo dragon, being cold-blooded and thus of slug-

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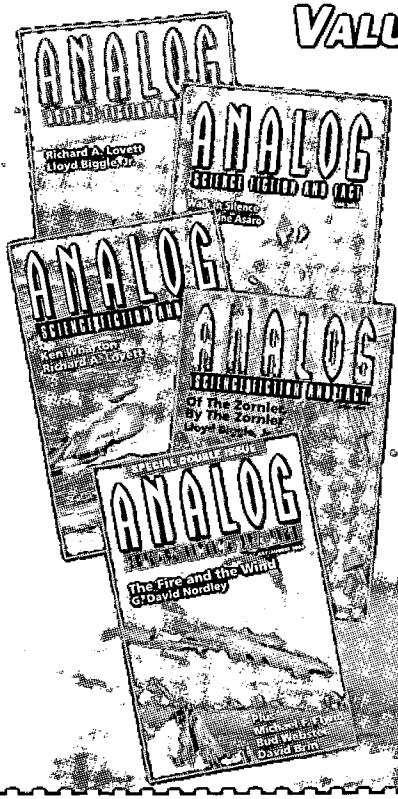

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gish metabolism, need no more than three times their body weight in food a year. Bakker showed that the predator-prey relationship for dinosaurs was two or three carnivores per hundred herbivores, about the same as it is for modern mammals. But for non-dinosaurian reptiles and amphibians the predator/prey ratio is closer to *40* per hundred.

For Bakker this proved that the dinosaurs had been alert, fast-moving warm-blooded creatures with the high energy needs that a physiology with internal-temperature-regulating capacity demands. His ideas have gained a wide following, despite the opposition of more conservative paleontologists such as Nicholas Hotton, who concedes that dinosaur physiology probably differed from that of modern reptiles, but will not go as far as accepting warm-bloodedness, declaring, "Alternative thermal strategies and life-styles available to dinosaurs may well have been as exotic as their body form, the like of which no man has ever seen."

And now comes the discovery of a dinosaur fossil containing a four-chambered heart. That clinches the issue—or does it?

Well, not exactly. Some scientists, like Dr. Paul C. Sereno of the University of Chicago, wonder whether the stone lump within Thescelosaurus really is its heart, or just a coincidentally heart-shaped mass. He has questioned the whole concept of preservation of internal organs in fossils.

Others accept the idea that the fossil does contain a heart, but are skeptical about its four-chamberedness. Here the evidence is unclear. The Carolina scientists admit that only the ventricles and aorta are distinguishable with the imaging methods that have been used so far. But they insist that the two upper chambers—the atria—must also have been present, since all reptilian hearts have two atria.

The development of more sophisticated scanning techniques will surely settle some of these questions. I suspect that we'll find that Thescelosaurus' heart *did* have four chambers, which will support the idea that dinosaurs had some sort of system for internal metabolic regulation. The dinosaurs, after all, dominated the world for a hundred million years, until—so it is widely thought—they were wiped out sixty-five million years ago by the apocalyptic climatic changes resulting from the collision of an asteroid or comet with the earth. For one group of animals to have maintained supremacy for such a length of time argues for their great biological adaptability.

This is not to say that the dinosaurs necessarily were warm-blooded animals the way lions and squirrels and sparrows and human beings are. As Richard Owen pointed out long ago, and such scientists as Nicholas Hotton and Armand de Ricqles have reiterated in our own time, dinosaurs may very well have had unique metabolic systems that at present we can't understand, because the fossil evidence is inadequate.

If so, it widens the range of probabilities for life in the universe in general. Up to now we've tended to assume that the system of categories with which we define terrestrial vertebrates—amphibians, reptiles, birds, mammals—would probably hold true on all planets that have environmental conditions analogous to ours. Such

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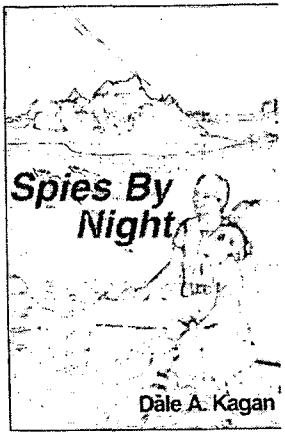

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thinking pretty well forecloses the possibility of non-mammalian intelligent life, which would be precluded by the metabolic limitations of reptiles and amphibians.

But we know that our own planet once harbored a race of reptilian beings that managed to maintain their position at the summit of creation for an immense period of time, until a cosmic catastrophe destroyed them, and it is beginning to appear that their metabolic systems were significantly different from those of the reptiles of today. We already know that it is a grave error to lump the dinosaurs together with such sleepy creatures as alligators and tortoises simply because similarities of their skeletal structures lead us to class them all as reptiles. There are reptiles and reptiles, evidently, and some were quicker and smarter than others.

Intelligent reptiles have long been a staple of science fiction, going back as far as E.E. Smith's Lensman novels of sixty years ago, one of whose heroes is the fearless Worsel of Velantia, "a nightmare's horror of hideously reptilian head, of leathern wings, of viciously fanged jaws, of frightfully taloned feet." Smith ignores the question of Worsel's metabolism, but surely a four-chambered heart must have beaten in that saurian bosom. The "wise and noble reptiles who had mastered superluminal physics" that James Patrick Kelly gave us a few years ago in his award-winning story "Think Like a Dinosaur" had to have been warm-blooded as well. And the fossil heart from South Dakota—if indeed that is what it is—provides us with the first substantive evidence that Earth's own dinosaurs may have been dynamic and intelligent animals. When and if the aliens come from space to visit us, it may very well turn out that they have the beady eyes and scaly skins of the reptilian critters SF long has loved to conjure up. O

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On the Net

James Patrick Kelly

SLIPSTREAM

namely

In a previous installment I commended a raft of new writers to your attention. One thing that struck me as I took stock of the next generation was how often they practice their craft in the slipstream. Now you should understand that many writers who might arguably fit into this literary movement reject the term *slipstream*. In the *Encyclopedia of Science Fiction,* **John Clute** <*http://www.johnclute.co.uk*> refers to it as fabulation. Some writers prefer to call what they do cross-genre or interstitial fiction, while others bristle at the notion that anyone is trying to label them at all. But it may well be too late to stick another name on slipstream, since the critical term has been around for some fourteen years now and people seem to have a general idea of what kind of writing it points at.

It was in July 1989 that **Bruce Sterling** <*http://www.well.com/conf/mirrorshades*> coined the term in his **Cat Scan** <*http://www.eff.org/Publications/Bruce_Sterling/Catscan_columns/catscan.05*> column in the late great zine, *SF Eye*. Here's the big moment: "It is a contemporary kind of writing which has set its face against consensus reality. It is fantastic, surreal sometimes, speculative on occasion, but not rigorously so. It does not aim to provoke a 'sense of wonder' or to systematically extrapolate in the manner of classic science fiction. Instead, this is a kind of writing that simply makes you feel very strange; the way that living in the late twentieth century makes you feel, if you are a person of a certain sensibility. We could call this kind of fiction Novels of Postmodern Sensibility, but that looks pretty bad on a category rack, and requires an acronym besides; so for the sake of convenience and argument, we will call these books 'slipstream.' " While I think Bruce's provisional definition holds up pretty well, most of his inductees into the slipstream club were folks whom we in the genre might actually think of as mainstream, for instance **Kathy Acker** <*http://acker.thehub.com.au/acker.htm*>, **Isabel Allende** <*http://www.isabelallende.com*>, **Martin Amis** <*http://martinamis.albion.edu*>, **Margaret Atwood** <*http://www.cariboo.bc.ca/atwood*>, and **Paul Auster** <*http://www.paulauster.co.uk*>. And those were just Bruce's "A's"!

our stream

While I certainly acknowledge that there are many mainstream writers whose work "simply makes you feel very strange," I am going

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to take a parochial approach here. Why? Well, I've taught **Clarion** <*http://www.msu.edu/~clarion*>, the science fiction writers' workshop at Michigan State University, six times now. I've also taught at **Odyssey** <*http://www.sff.net/odyssey*>, the other six-week genre workshop, held in Manchester, New Hampshire, and **Viable Paradise** <*http://www.sff.net/paradise*>, a one-week intensive that takes place on Martha's Vineyard. I've taken a good hard look at the people who are going to be writing your favorite stories of 2013 and what I've noticed is that more and more of them are modeling themselves after **Karen Joy Fowler** <*http://www.sfwa.org/members/Fowler*> and **Jonathan Lethem** <*http://www.sinc.sunysb.edu/Stu/dmyers*> as opposed to . . . say, **Greg Egan** <*http://www.netspace.net.au/~gregegan*> and Bruce Sterling. Don't get me wrong; I admire all four of these writers; I say we should pitch as large a literary tent as we can. But there's something going on here that's worth paying attention to. So for now, I'm more interested in tracking the folks who start out from our tradition in their journey across genres than I am in mainstream writers who stop in to mess with our tropes. And I've invited two of the sharpest minds in science fiction, writer **Jeff VanderMeer** <*http://www.vandermeer.redsine.com*> and critic **Rich Horton** <*http://www.sff.net/people/richard.horton*> along as guides.

So what is slipstream, Rich? "Most commonly defined, I think, as fiction that crosses genre boundaries (lots of people seem to prefer 'cross-genre' as a term). However, I'm not sure that's very satisfying: is **The Caves of Steel** <*http://members.aol.com/firoane/asimov.htm*> slipstream because it crosses genre boundaries between SF and mystery? So, thinking about it, I decided that to me slipstream stories feel a bit like magical realism. The key is—they are unexplained. 'Real' fantasy or SF has these elements embedded in the background so that they make sense—in slipstream they are just there. In a sense, SF tries to make the strange familiar—by showing SFnal elements in a context that helps us understand them. Slipstream tries to make the familiar strange—by taking a familiar context and disturbing it with SFnal/ fantastical intrusions."

Jeff is uneasy with definitions. "I prefer, like **Ellen Datlow** <*http://www.datlow.com*>, to call it 'cross-genre.' Today, we have literally many dozens of writers in both mainstream and genre who are working from these influences and creating new forms of cross-pollination. The problem with talking about cross-genre is that it's not a single movement—it's a bunch of individual writers pursuing individual visions that tend to simply share some of the same diverse influences. So it's difficult to pin down and say 'this is what it is and what it isn't.' That's what is exciting to me about it—that it is difficult to categorize. In a sense, that means it's a complex, organic creature."

top two

Perhaps *the* place to begin looking for slipstream on the web is **Fantastic Metropolis** <*http://www.fantasticmetropolis.com*>. I

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first mentioned this site last summer, but I'm pointing you at it again because it has burgeoned since then. I will admit to being surprised by the quality of the writing *FM* offers—both fiction and nonfiction—since it's not a paying site. Everything you see here is donated. Clearly some of our best practitioners have decided that this is a site worth supporting, in part because it advocates so eloquently for the importance of taking genre in new directions. There is a wealth of fiction here, some original but mostly reprints from the likes of **China Miéville** <*http://www.panmacmillan.com/Features/China*>, **Carol Emshwiller** <*http://www.sfwa.org/members/emshwiller*>, **L. Timmel Duchamp** <*http://ltimmel.home.mindspring.com*>, **Paul Di Filippo** <*http://www.cambrianpubs.com/difilippo*>, and **Kelly Link** <*http://www.kellylink.net*>, to name but a handful. And as good as the stories are, the critical essays and interviews are equally accomplished, with work from **Michael Moorcock** <*http://www.multiverse.org*>, **David Langford** <*http://www.ansible.demon.co.uk*>, **James Sallis** <*http://www.grasslimb.com/sallies*>, and **Jeffrey Ford** <*http://www.sfsite.com/06b/jf130.htm*>.

Here is new writer **Alan DeNiro** <*http://www.taverners-koans.com/ratbastards/alan.html*> struggling to define the relationship of cross-genre writing to the established genres in his original essay published in *FM*, **"The Dream of The Unified Field"** <*http://www.fantasticmetropolis.com/show.html?ey, unified,1*>. "The genre's new shape might be less of a centralized state and more of a Hanseatic League, a confederation or constellation of different styles, techniques, and even audiences. This is not quite as scary as it sounds; it's a different but more realistic model for the way the field is already going. The larger magazines will have the central place at the head of the table, but there will be a lot more activity at the side tables—or better yet, in the kitchen amongst the help. There may not be a Next Wave, implying a stable shore, a body of water, and a singular undertow. There might be lots of little waves."

While not explicitly in the slipstream, **Strange Horizons** <*http://www.strangehorizons.com*> has published most of the up-and-coming writers who experiment with genre. As Editor-in-chief **Mary Anne Mohanraj** <*http://www.mamohanraj.com*> wrote in **"Avoiding the Potholes: Adventures in Genre-Crossing"** <*http://www.strangehorizons.com/2001/20010702/editorial.shtml*>, "I think at *Strange Horizons*, our editors often choose material that lives in the borderlands between spec fic and other genres. And while it can be tricky navigating these roads, in the long run, I think that border-crossing enriches literature." While in his wonderful **"Where Does Genre Come From?"** <*http://www.strangehorizons.com/2001/20011203/editorial.shtml*>, Senior Fiction Editor **Jed Hartman** <*http://www.kith.org/logos*> wrote, "By a loose definition of slipstream, probably the majority of the fiction that we at *Strange Horizons* publish could be labeled that way, but calling us a slipstream magazine would probably give the wrong idea. . . . We in the *Strange Horizons* fiction department are definitely interested in slipstream, but we do generally require that sto-

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ries we publish have a fairly clear speculative element."

Some of the writers to watch who have appeared recently in *SH* are **Aynjel Kaye** <*http://www.digitaldelirium.org/aynjel*>, **Benjamin Rosenbaum** <*http://home.datacomm.ch/benrose*>, **Jenn Reese** <*http://www.memoryandreason.com*>, **Jay Lake** <*http://www.jlake.com*>,**Tim Pratt** <*http://www.sff.net/people/timpratt*>, and **Timons Esaias** <*http://timonsesaias.com*>.

exit

I asked both Jeff and Rich whether slipstream might be the next big thing in our genre, or is it perhaps a successor species to SF? Rich wrote, "I hope not the latter—I don't want to lose 'old-fashioned SF.' But I do think that slipstream techniques can help to describe a world that seems SFnal around us—a world that is changing fast enough, and that is multicultural enough, that everyday life can seem strange in a 'slipstream' fashion."

Jeff agrees, "I certainly don't want it to replace SF. I love SF, too. The problem, the friction or opposition, comes from some of the more traditional genre gatekeepers either being too slow to incorporate these new kinds of writings or totally resistant to doing so—which makes those of us who practice them put more energy into just opening up new ways to find an audience. This energy is perceived as in opposition to traditional genre, even though it really isn't. My fear, again, is that if this is the wave of the future and genre doesn't allow it access, it will turn somewhere else, like the mainstream, and we'll lose energy that would otherwise help create further mutation within genre."

My take? First a confession. I learned everything I know about writing across genre from the three muses of slipstream: Carol Emshwiller, Karen Joy Fowler, and Kelly Link. I've had the honor of workshopping with all three. I've listened to them react to critiques of their own work and learned from the way they unpack other people's stories, especially my own. And over the years, because I admire what they do, I've tried to do it myself. To hell with the anxiety of influence—I can point to specific stories of mine that are in dialogue with the work of each of these fine writers. The thing is, I know what it feels like when I'm writing science fiction and fantasy; I understand what it takes to build the worlds and complicate the plots. But when I write slipstream, I find myself adopting different strategies, shifting my expectations. I don't understand everything; the writing *feels* different. Strange. I suppose that's not a very useful description, but there it is. So on a personal level, I can say that *my* slipstream has its own techniques, its own possibilities, and its own rewards. It is close to SF, but it is not the same as it. But as it accretes more talented writers, slipstream is pulling SF in its direction. Where will both of these kinds of writing end up?

That's a question I'd like to return to next time. ○

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JUST LIKE THE ONES WE USED TO KNOW

Connie Willis

Hugo- and Nebula-award-winning author Connie Willis is currently at work on *All Clear,* a new time-travel novel. Set in the Blitz, the book will most likely be published in early 2005. One of the author's most recent publications—*Roswell, Vegas, and Area 51: Travels with Courtney* (a chapbook for Wormhole Books)—was released in September 2002. It's a nonfiction account of the author's trip into the heart of UFO-land.

The snow started at 12:01 A.M. Eastern Standard Time just outside of Branford, Connecticut. Noah and Terry Blake, on their way home from a party at the Whittiers' at which Miranda Whittier had said, "I guess you could call this our Christmas Eve *Eve* party!" at least fifty times, noticed a few stray flakes as they turned onto Canoe Brook Road, and by the time they reached home, the snow was coming down hard.

"Oh, good," Tess said, leaning forward to peer through the windshield, "I've been hoping we'd have a white Christmas this year."

At 1:37 A.M. Central Standard Time, Billy Grogan, filling in for KYZT's late-night radio request show out of Duluth, said, "This just in from the National Weather Service. Snow advisory for the Great Lakes region tonight and tomorrow morning. Two to four inches expected," and then went back to discussing the callers' least favorite Christmas songs.

"I'll tell you the one I hate," a caller from Wauwatosa said. " 'White Christmas.' I musta heard that thing five hundred times this month."

"Actually," Billy said, "according to the St. Cloud *Evening News,* Bing

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Crosby's version of 'White Christmas' will be played 2150 times during the month of December, and other artists' renditions of it will be played an additional 1890 times."

The caller snorted. "One time's too many for me. Who the heck wants a white Christmas anyway? I sure don't."

"Well, unfortunately, it looks like you're going to get one," Billy said. "And, in that spirit, here's Destiny's Child, singing 'White Christmas.'"

At 1:45 A.M., a number of geese in the city park in Bowling Green, Kentucky, woke up to a dark, low, overcast sky and flew, flapping and honking loudly, over the city center, as if they had suddenly decided to fly farther south for the winter. The noise woke Maureen Reynolds, who couldn't get back to sleep. She turned on KYOU, which was playing "Holly Jolly Oldies," including "Rockin' Around the Christmas Tree" and Brenda Lee's rendition of "White Christmas."

At 2:15 A.M. Mountain Standard Time, Paula Devereaux arrived at DIA for the red-eye flight to Springfield, Illinois. It was beginning to snow, and as she waited in line at the express check-in (she was carrying on her bridesmaid dress and the bag with her shoes and slip and makeup—the last time she'd been in a wedding, her luggage had gotten lost and caused a major crisis) and in line at security and in line at the gate and in line to be de-iced, she began to hope they might not be able to take off, but no such luck.

Of course not, Paula thought, looking out the window at the snow swirling around the wing, because Stacey wants me at her wedding.

"I want a Christmas Eve wedding," Stacey'd told Paula after she'd informed her she was going to be her maid of honor, "all candlelight and evergreens. And I want snow falling outside the windows."

"What if the weather doesn't cooperate?" Paula'd asked.

"It will," Stacey'd said. And here it was, snowing. She wondered if it was snowing in Springfield, too. Of course it is, she thought. Whatever Stacey wants, Stacey gets, Paula thought. Even Jim.

Don't think about that, she told herself. Don't think about anything. Just concentrate on getting through the wedding. With luck, Jim won't even be there except for the ceremony, and you won't have to spend any time with him at all.

She picked up the in-flight magazine and tried to read and then plugged in her headphones and listened to Channel 4, "Seasonal Favorites." The first song was "White Christmas" by the Statler Brothers.

At 3:38 A.M., it began to snow in Bowling Green, Kentucky. The geese circling the city flew back to the park, landed, and hunkered down to sit it out on their island in the lake. Snow began to collect on their backs, but they didn't care, protected as they were by down and a thick layer of subcutaneous fat designed to keep them warm even in sub-zero temperatures.

At 3:39 A.M., Luke Lafferty woke up, convinced he'd forgotten to set the goose his mother had talked him into having for Christmas Eve dinner

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out to thaw. He went and checked. He *had* set it out. On his way back to bed, he looked out the window and saw it was snowing, which didn't worry him. The news had said isolated snow showers for Wichita, ending by mid-morning, and none of his relatives lived more than an hour and a half away, except Aunt Lulla, and if she couldn't make it, it wouldn't exactly put a crimp in the conversation. His mom and Aunt Madge talked so much it was hard for anybody else to get a word in edgewise, especially Aunt Lulla. "She was always the shy one," Luke's mother said, and it was true, Luke couldn't remember her saying anything other than "Please pass the potatoes," at their family get-togethers.

What did worry him was the goose. He should never have let his mother talk him into having one. It was bad enough her having talked him into having the family dinner at his place. He had no idea how to cook a goose.

"What if something goes wrong?" he'd protested. "Butterball doesn't have a goose hotline."

"You won't need a hotline," his mother had said. "It's just like cooking a turkey, and it's not as if you had to cook it. I'll be there in time to put it in the oven and everything. All you have to do is set it out to thaw. Do you have a roasting pan?"

"Yes," Luke had said, but lying there, he couldn't remember if he did. When he got up at 4:14 A.M. to check—he did—it was still snowing.

At 4:16 A.M. Mountain Standard Time, Slade Henry, filling in on WRYT's late-late-night talk show out of Boise, said, "For all you folks who wanted a white Christmas, it looks like you're going to get your wish. Three to six inches forecast for western Idaho." He played several bars of Johnny Cash's "White Christmas," and then went back to discussing JFK's assassination with a caller who was convinced Clinton was somehow involved.

"Little Rock isn't all that far from Dallas, you know," the caller said. "You could drive it in four and a half hours."

Actually, you couldn't, because I-30 was icing up badly, due to freezing rain that had started just after midnight and then turned to snow. The treacherous driving conditions did not slow Monty Luffer down, as he had a Ford Explorer. Shortly after five, he reached to change stations on the radio so he didn't have to listen to "those damn Backstreet Boys" singing "White Christmas," and slid out of control just west of Texarkana. He crossed the median, causing the semi in the left-hand eastbound lane to jam on his brakes and jackknife, and resulting in a thirty-seven-car pileup that closed the road for the rest of the night and all the next day.

At 5:21 A.M. Pacific Standard Time, four-year-old Miguel Gutierrez jumped on his mother, shouting, "Is it Christmas yet?"

"Not on Mommy's stomach, honey," Pilar murmured and rolled over.

Miguel crawled over her and repeated his question directly into her ear. "*Is it Christmas yet?*"

"No," she said groggily. "Tomorrow's Christmas. Go watch cartoons for a few minutes, okay? and then Mommy'll get up," and pulled the pillow over her head.

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Miguel was back again immediately. He can't find the remote, she thought wearily, but that couldn't be it, because he jabbed her in the ribs with it. "What's the matter, honey?" she said.

"Santa isn't gonna come," he said tearfully, which brought her fully awake.

He thinks Santa won't be able to find him, she thought. This is all Joe's fault. According to the original custody agreement, she had Miguel for Christmas and Joe had him for New Year's, but he'd gotten the judge to change it so they split Christmas Eve and Christmas Day, and then, after she'd told Miguel, Joe had announced he needed to switch.

When Pilar had said no, he'd threatened to take her back to court, so she'd agreed, after which he'd informed her that "Christmas Day" meant her delivering Miguel on Christmas Eve so he could wake up and open his presents at Joe's.

"He can open your presents to him before you come," he'd said, knowing full well Miguel still believed in Santa Claus. So after supper she was delivering both Miguel *and* his presents to Joe's in Escondido, where she would not get to see Miguel open them.

"I can't go to Daddy's," Miguel had said when she'd explained the arrangements, "Santa's gonna bring my presents *here*."

"No, he won't," she'd said. "I sent Santa a letter and told him you'd be at your daddy's on Christmas Eve, and he's going to take your presents there."

"You sent it to the North Pole?" he'd demanded.

"To the North Pole. I took it to the post office this morning," and he'd seemed contented with that answer. Till now.

"Santa's going to come," she said, cuddling him to her. "He's coming to Daddy's, remember?"

"No, he's not," Miguel sniffled.

Damn Joe. I shouldn't have given in, she thought, but every time they went back to court, Joe and his snake of a lawyer managed to wangle new concessions out of the judge, even though until the divorce was final, Joe had never paid any attention to Miguel at all. And she just couldn't afford any more court costs right now.

"Are you worried about Daddy living in Escondido?" she asked Miguel. "Because Santa's magic. He can travel all over California in one night. He can travel all over the *world* in one night."

Miguel, snuggled against her, shook his head violently. "No, he can't!"

"Why not?"

"Because it isn't *snowing!* I want it to snow. Santa can't come in his sleigh if it doesn't."

Paula's flight landed in Springfield at 7:48 A.M. Central Standard Time, twenty minutes late. Jim met her at the airport. "Stacey's having her hair done," he said. "I was afraid I wouldn't get here in time. It was a good thing your flight was a few minutes late."

"There was snow in Denver," Paula said, trying not to look at him. He was as cute as ever, with the same knee-weakening smile.

"It just started to snow here," he said.

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How does she do it? Paula thought. You had to admire Stacey. Whatever she wanted, she got. I wouldn't have had to mess with carrying this stuff on, Paula thought, handing Jim the hanging bag with her dress in it. There's no way my luggage would have gotten lost. Stacey wanted it here.

"The roads are already starting to get slick," Jim was saying. "I hope my parents get here okay. They're driving down from Chicago."

They will, Paula thought. Stacey wants them to.

Jim got Paula's bags off the carousel and then said, "Hang on, I promised Stacey I'd tell her as soon as you got here." He flipped open his cell phone and put it to his ear. "Stacey? She's here. Yeah, I will. Okay, I'll pick them up on our way. Yeah. Okay."

He flipped the phone shut. "She wants us to pick up the evergreen garlands on our way," he said, "and then I have to come back and get Kindra and David. We need to check on their flights before we leave."

He led the way upstairs to ticketing so they could look at the arrival board. Outside the terminal windows snow was falling—large, perfect, lacy flakes.

"Kindra's on the two-nineteen from Houston," Jim said, scanning the board, "and David's on the eleven-forty from Newark. Oh, good, they're both on time."

Of course they are, Paula thought, looking at the board. The snow in Denver must be getting worse. All the Denver flights had "delayed" next to them, and so did a bunch of others: Cheyenne and Portland and Richmond. As she watched, Boston and then Chicago changed from "on time" to "delayed" and Rapid City went from "delayed" to "cancelled." She looked at Kindra's and David's flights again. They were still on time.

Ski areas in Aspen, Lake Placid, Squaw Valley, Stowe, Lake Tahoe, and Jackson Hole woke to several inches of fresh powder. The snow was greeted with relief by the people who had paid ninety dollars for their lift tickets, with irritation by the ski resort owners, who didn't see why it couldn't have come two weeks earlier when people were making their Christmas reservations, and with whoops of delight by snowboarders Kent Slakken and Bodine Cromps. They promptly set out from Breckenridge without maps, matches, helmets, avalanche beacons, avalanche probes, or telling anyone where they were going, for an off-limits backcountry area with "totally extreme slopes."

At 7:05, Miguel came in and jumped on Pilar again, this time on her bladder, shouting, "It's snowing! Now Santa can come! Now Santa can come!"

"Snowing?" she said blearily. In L.A.? "Snowing? Where?"

"On TV. Can I make myself some cereal?"

"No," she said, remembering the last time. She reached for her robe. "You go watch TV some more and Mommy'll make pancakes."

When she brought the pancakes and syrup in, Miguel was sitting, absorbed, in front of the TV, watching a man in a green parka standing in the snow in front of an ambulance with flashing lights, saying, "—third weather-related fatality in Dodge City so far this morning—"

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"Let's find some cartoons to watch," Pilar said, clicking the remote.

"—outside Knoxville, Tennessee, where snow and icy conditions have caused a multi-car accident—"

She clicked the remote again.

"—to Columbia, South Carolina, where a surprise snowstorm has shut off power to—"

Click.

"—problem seems to be a low-pressure area covering Canada and the northern two-thirds of the United States, bringing snow to the entire Midwest and Mid-Atlantic States and—"

Click.

"—snowing here in Bozeman—"

"I told you it was snowing," Miguel said happily, eating his pancakes, "just like I wanted it to. After breakfast can we make a snowman?"

"Honey, it isn't snowing here in California," Pilar said. "That's the national weather, it's not here. That reporter's in Montana, not California."

Miguel grabbed the remote and clicked to a reporter standing in the snow in front of a giant redwood tree. "The snow started about four this morning here in Monterey, California. As you can see," she said, indicating her raincoat and umbrella, "it caught everybody by surprise."

"*She's* in California," Miguel said.

"She's in northern California," Pilar said, "which gets a lot colder than it does here in L.A. L.A.'s too warm for it to snow."

"No, it's not," Miguel said and pointed out the window, where big white flakes were drifting down onto the palm trees across the street.

At 9:40 Central Standard Time the cell phone Nathan Andrews thought he'd turned off rang in the middle of a grant money meeting that was already going badly. Scheduling the meeting in Omaha on the day before Christmas had seemed like a good idea at the time—businessmen had hardly any appointments that day and the spirit of the season was supposed to make them more willing to open their pocketbooks—but instead they were merely distracted, anxious to do their last-minute Lexus shopping or get the Christmas office party started or whatever it was businessmen did, and worried about the snow that had started during rush hour this morning.

Plus, they were morons. "So you're saying you want a grant to study global warming, but then you talk about wanting to measure snow levels," one of them had said. "What does snow have to do with global warming?"

Nathan had tried to explain *again* how warming could lead to increased amounts of moisture in the atmosphere and thus increased precipitation in the form of rain and snow, and how that increased snowfall could lead to increased albedo and surface cooling.

"If it's getting cooler, it's not getting warmer," another one of the businessmen had said. "It can't be both."

"As a matter of fact, it can," he'd said and launched into his explanation of how polar melting could lead to an increase in freshwater in the North Atlantic, which would float on top of the Gulf Stream, preventing its

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warm water from sinking and cooling, and effectively shutting the current down. "Europe would freeze," he'd said.

"Well, then, global warming would be a good thing, wouldn't it?" yet another one had said. "Heat the place up."

He had patiently tried to explain how the world would grow both hotter and colder, with widespread droughts, flooding, and a sharp increase in severe weather. "And these changes may happen extremely quickly," he'd said. "Rather than temperatures gradually increasing and sea levels rising, there may be a sudden, unexpected event—a discontinuity. It may take the form of an abrupt, catastrophic temperature increase or a superhurricane or other form of megastorm, occurring without any warning. That's why this project is so critical. By setting up a comprehensive climate data base, we'll be able to create more accurate computer models, from which we'll be able to—"

"Computer models!" one of them had snorted. "They're wrong more often than they're right!"

"Because they don't include enough factors," Nathan said. "Climate is an incredibly complicated system, with literally thousands of factors interacting in intricate ways—weather patterns, clouds, precipitation, ocean currents, manmade activities, crops. Thus far computer models have only been able to chart a handful of factors. This project will chart over two hundred of them and will enable the models to be exponentially more accurate. We'll be able to predict a discontinuity before it happens—"

It was at that point that his cell phone rang. It was his graduate assistant Chin Sung, from the lab. "Where *are* you?" Chin demanded.

"In a grant meeting," Nathan whispered. "Can I call you back in a few minutes?"

"Not if you still want the Nobel Prize," Chin said. "You know that harebrained theory of yours about global warming producing a sudden discontinuity? Well, I think you'd better get over here. Today may be the day you turn out to be right."

"Why?" Nathan asked, gripping the phone excitedly. "What's happened? Have the Gulf Stream temp readings dropped?"

"No, it's not the currents. It's what's happening here."

"Which is what?"

Instead of answering, Chin asked, "Is it snowing where you are?"

Nathan looked out the conference room window. "Yes."

"I thought so. It's snowing here, too."

"And that's what you called me about?" Nathan whispered. "Because it's snowing in Nebraska in December? In case you haven't looked at a calendar lately, winter started three days ago. It's *supposed* to be snowing."

"You don't understand," Chin said. "It isn't just snowing in Nebraska. It's snowing everywhere."

"What do you mean, everywhere?"

"I mean everywhere. Seattle, Salt Lake City, Minneapolis, Providence, Chattanooga. All over Canada and the U.S. as far south as—" there was a pause and the sound of computer keys clicking, "Abilene and Shreveport and Savannah. No, wait, Tallahassee's reporting light snow. As far south as Tallahassee."

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The jet stream must have dipped radically south. "Where's the center of the low pressure system?"

"That's just it," Chin said. "There doesn't seem to be one."

"I'll be right there," Nathan said.

A mile from the highway snowboarders Kent Slakken and Bodine Cromps, unable to see the road in heavily falling snow, drove their car into a ditch. "Shit," Bodine said, and attempted to get out of it by revving the engine and then flooring it, a technique that only succeeded in digging them in to the point where they couldn't open either car door.

It took Jim and Paula nearly two hours to pick up the evergreen garlands and get out to the church. The lacy flakes fell steadily faster and thicker, and it was so slick Jim had to crawl the last few miles. "I hope this doesn't get any worse," he said worriedly, "or people are going to have a hard time getting out here."

But Stacey wasn't worried at all. "Isn't it beautiful? I wanted it to snow for my wedding more than anything," she said, meeting them at the door of the church. "Come here, Paula, you've got to see how the snow looks through the sanctuary windows. It's going to be perfect."

Jim left immediately to go pick up Kindra and David, which Paula was grateful for. Being that close to him in the car had made her start entertaining the ridiculous hopes about him she'd had when they first met. And they were ridiculous. One look at Stacey had shown her that.

The bride-to-be looked beautiful even in a sweater and jeans, her makeup exquisite, her blonde hair upswept into glittery snowflake-sprinkled curls. Every time Paula had had her hair done to be in a wedding, she had come out looking like someone in a bad 1950's movie. How does she do it? Paula wondered. You watch, the snow will stop and start up again just in time for the ceremony.

But it didn't. It continued to come down steadily, and when the minister arrived for the rehearsal, she said, "I don't know. It took me half an hour to get out of my driveway. You may want to think about canceling."

"Don't be silly. We can't cancel. It's a Christmas Eve wedding," Stacey said, and made Paula start tying the evergreen garlands to the pews with white satin ribbon.

It was sprinkling in Santa Fe when Bev Carey arrived at her hotel, and by the time she'd checked in and ventured out into the plaza, it had turned into an icy, driving rain that went right through the light coat and thin gloves she'd brought with her. She had planned to spend the morning shopping, but the shops had signs on them saying "Closed Christmas Eve and Christmas Day," and the sidewalk in front of the Governor's Palace, where, according to her guidebook, Zunis and Navajos sat to sell authentic silver-and-turquoise jewelry, was deserted.

But at least it's not snowing, she told herself, trudging, shivering, back to the hotel. And the shop windows were decorated with *ristras* and lights in the shape of chili peppers, and the Christmas tree in the hotel lobby was decorated with kachina dolls.

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Her friend Janice had already called and left a message with the hotel clerk. And if I don't call her back, she'll be convinced I've taken a bottle of sleeping pills, Bev thought, going up to her room. On the way to the airport, Janice had asked anxiously, "You haven't been having suicidal thoughts, have you?" and when her friend Louise had found out what Bev was planning, she'd said, "I saw this piece on *Dateline* the other night about suicides at Christmas, and how people who've lost a spouse are especially vulnerable. You wouldn't do anything like that, would you?"

They none of them understood that she was doing this to save her life, not end it, that it was Christmas at home, with its lighted trees and evergreen wreaths and candles, that would kill her. And its snow.

"I know you miss Howard," Janice had said, "and that with Christmas coming, you're feeling sad."

Sad? She felt flayed, battered, beaten. Every memory, every thought of her husband, every use of the past tense even— "Howard liked . . ." "Howard knew . . ." "Howard was . . ."—was like a deadly blow. The grief-counseling books all talked about "the pain of losing a loved one," but she had had no idea the pain could be this bad. It was like being stabbed over and over, and her only hope had been to get away. She hadn't "decided to go to Santa Fe for Christmas." She had run there like a victim fleeing a murderer.

She took off her drenched coat and gloves and called Janice. "You promised you'd call as soon as you got there," Janice said reproachfully. "Are you all right?"

"I'm fine," Bev said. "I was out walking around the Plaza." She didn't say anything about its raining. She didn't want Janice saying, I told you so. "It's beautiful here."

"I should have come with you," Janice said. "It's snowing like crazy here. Ten inches so far. I suppose you're sitting on a patio drinking a margarita right now."

"Sangria," Bev lied. "I'm going sightseeing this afternoon. The houses here are all pink and tan adobe with bright blue and red and yellow doors. And right now the whole town's decorated with *luminarias*. You should see them."

"I wish I could," Janice sighed. "All I can see is snow. I have no idea how I'm going to get to the store. Oh, well, at least we'll have a white Christmas. It's so sad Howard can't be here to see this. He always loved white Christmases, didn't he?"

Howard, consulting the *Farmer's Almanac,* reading the weather forecast out loud to her, calling her over to the picture window to watch the snow beginning to fall, saying, "Looks like we're going to get a white Christmas this year," as if it were a present under the tree, putting his arm around her—

"Yes," Bev managed to say through the sudden, searing stab of pain. "He did."

It was spitting snow when Warren Nesvick checked into the Marriott in Baltimore. As soon as he got Shara up to the suite, he told her he had to make a business call, "and then I'll be all yours, honey." He went down

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to the lobby. The TV in the corner was showing a weather map. He looked at it for a minute and then got out his cell phone.

"Where *are* you?" his wife Marjean said when she answered.

"In St. Louis," he said. "Our flight got rerouted here because of snow at O'Hare. What's the weather like there?"

"It's snowing," she said. "When do you think you'll be able to get a flight out?"

"I don't know. Everything's booked because of it being Christmas Eve. I'm waiting to see if I can get on standby. I'll call you as soon as I know something," and hung up before she could ask him which flight.

It took Nathan an hour and a half to drive the fifteen miles to the lab. During the ride he considered the likelihood that this was really a discontinuity and not just a major snowstorm. Global warming proponents (and opponents) confused the two all the time. Every hurricane, tornado, heat wave, or dry spell was attributed to global warming, even though nearly all of them fell well within the range of normal weather patterns.

And there had been big December snowstorms before. The blizzard of 1888, for instance, and the Christmas Eve storm of 2002. And Chin was probably wrong about there being no center to the low pressure system. The likely explanation was that there was more than one system involved—one centered in the Great Lakes and another just east of the Rockies, colliding with warm, moist air from the Gulf Coast to create unusually widespread snow.

And it *was* widespread. The car radio was reporting snow all across the Midwest and the entire East Coast—Topeka, Tulsa, Peoria, northern Virginia, Hartford, Montpelier, Reno, Spokane. No, Reno and Spokane were west of the Rockies. There must be a third system, coming down from the Northwest. But it was still hardly a discontinuity.

The lab parking lot hadn't been plowed. He left the car on the street and struggled through the already knee-deep snow to the door, remembering when he was halfway across the expanse that Nebraska was famous for pioneers who got lost going out to the barn in a blizzard and whose frozen bodies weren't found till the following spring.

He reached the door, opened it, and stood there a moment blowing on his frozen hands and looking at the TV Chin had stuck on a cart in the corner of the lab. On it, a pretty reporter in a parka and a Mickey Mouse hat was standing in heavy snow in front of what seemed to be a giant snowman. "The snow has really caused problems here at Disney World," she said over the sound of a marching band playing "White Christmas." "Their annual Christmas Eve Parade has—"

"Well, it's about time," Chin said, coming in from the fax room with a handful of printouts. "What took you so long?"

Nathan ignored that. "Have you got the IPOC data?" he asked.

Chin nodded. He sat down at his terminal and started typing. The upper left-hand screen lit up with columns of numbers.

"Let me see the National Weather Service map," Nathan said, unzipping his coat and sitting down at the main console.

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Chin called up a U.S. map nearly half-covered with blue, from western Oregon and Nevada east all the way to the Atlantic and up through New England and south to the Oklahoma panhandle, northern Mississippi, Alabama, and most of Georgia.

"Good Lord, that's even bigger than Marina in '92," Nathan said. "Have you got a satellite photo?"

Chin nodded and called it up. "And this is a real-time composite of all the data coming in, including weather stations, towns, and spotters reporting in. The white's snow," he added unnecessarily.

The white covered even more territory than the blue on the NWS map, with jagged fingers stretching down into Arizona and Louisiana and west into Oregon and California. Surrounding them were wide uneven pink bands. "Is the pink rain?" Nathan asked.

"Sleet," Chin said. "So what do you think? It's a discontinuity, isn't it?"

"I don't know," Nathan said, calling up the barometric readings and starting through them.

"What else could it be? It's snowing in Orlando. And San Diego."

"It's snowed both of those places before," Nathan said. "It's even snowed in Death Valley. The only place in the U.S. where it's never snowed is the Florida Keys. And Hawaii, of course. Everything on this map right now is within the range of normal weather events. You don't have to start worrying till it starts snowing in the Florida Keys."

"What about other places?" Chin asked, looking at the center right-hand screen.

"What do you mean, other places?"

"I mean, it isn't just snowing in the U.S. I'm getting reports from Cancun. And Jerusalem."

At eleven-thirty Pilar gave up trying to explain that there wasn't enough snow to make a snowman and took Miguel outside, bundled up in a sweatshirt, a sweater, and his warm jacket, with a pair of Pilar's tube socks for mittens. He lasted about five minutes.

When they came back in, Pilar settled him at the kitchen table with crayons and paper so he could draw a picture of a snowman and went into the living room to check the weather forecast. It was really snowing hard out there, and she was getting a little worried about taking Miguel down to Escondido. Los Angelenos didn't know how to drive in snow, and Pilar's tires weren't that good.

"—snowing here in Hollywood," said a reporter standing in front of the nearly invisible Hollywood sign, "and this isn't special effects, folks, it's the real thing."

She switched channels. "—snowing in Santa Monica," a reporter standing on the beach was saying, "but that isn't stopping the surfers. . . ."

Click. "—para la primera vez en cincuenta anos en Marina del Rey—"

Click. "—snowing here in LA for the first time in nearly fifty years. We're here on the set of *XXX II* with Vin Diesel. What do you think of the snow, Vin?"

She gave up and went back in the kitchen where Miguel announced he was ready to go outside again. She talked him into listening to Alvin and

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the Chipmunks instead. "Okay," he said, and she left him warbling "White Christmas" along with Alvin and went in to check the weather again. The Santa Monica reporter briefly mentioned the roads were wet before moving on to interview a psychic who claimed to have predicted the snowstorm, and on a Spanish-language channel she caught a glimpse of the 405 moving along at its usual congested pace.

The roads must not be too bad, she thought, or they'd all be talking about it, but she still wondered if she hadn't better take Miguel down to Escondido early. She hated to give up her day with him, but his safety was the important thing, and the snow wasn't letting up at all.

When Miguel came into the living room and asked when they could go outside, she said, "After we pack your suitcase, okay? Do you want to take your Pokémon jammies or your Spider-Mans?" and began gathering up his things.

By noon Eastern Standard Time, it was snowing in every state in the lower forty-eight. Elko, Nevada, had over two feet of snow, Cincinnati was reporting thirty-eight inches at the airport, and it was spitting snow in Miami.

On talk radio, JFK's assassination had given way to the topic of the snow. "You mark my words, the terrorists are behind this," a caller from Terre Haute said. "They want to destroy our economy, and what better way to do it than by keeping us from doing our last-minute Christmas shopping? To say nothing of what this snow's going to do to my relationship with my wife. How am I supposed to go buy her something in this weather? I tell you, this has got Al Qaeda's name written all over it."

During lunch, Warren Nesvick told Shara he needed to go try his business call again. "The guy I was trying to get in touch with wasn't in the office before. Because of the snow," he said and went out to the lobby to call Marjean again. On the TV in the corner, there were shots of snow-covered runways and jammed ticket counters. A blonde reporter in a tight red sweater was saying, "Here in Cincinnati, the snow just keeps on falling. The airport's still open, but officials indicate it may have to close. Snow is building up on the runways—"

He called Marjean. "I'm in Cincinnati," he told her. "I managed to get a flight at the last minute. There's a three-hour layover till my connecting flight, but at least I've got a seat."

"But isn't it snowing in Cincinnati?" she asked. "I was just watching the TV and . . ."

"It's supposed to let up here in an hour or so. I'm really sorry about this, honey. You know I'd be there for Christmas Eve if I could."

"I know," she said, sounding disappointed. "It's okay, Warren. You can't control the weather."

The television was on in the hotel lobby when Bev came down to lunch. ". . . snowing in Albuquerque," she heard the announcer say, "Raton, Santa Rosa, and Wagon Mound."

But not in Santa Fe, she told herself firmly, going into the dining room.

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"It hardly ever snows there," the travel agent had said, "New Mexico's a desert. And when it does snow, it never sticks."

"There's already four inches in Espanola," a plump waitress in a ruffled blouse and full red skirt was saying to the busboy. "I'm worried about getting home."

"I'd rather it didn't snow for Christmas," Bev had teased Howard last year, "all those people trying to get home."

"Heresy, woman, heresy! What would Currier and Ives think to hear you talk that way?" he'd said, clutching his chest.

Like she was clutching hers now. The plump waitress was looking at her worriedly. "Are you all right, *señora?*"

"Yes," Bev said. "One for lunch, please."

The waitress led her to a table, still looking concerned, and handed her a menu, and she clung to it like a life raft, concentrating fiercely on the unfamiliar terms, the exotic ingredients: blue corn tortillas, quesadillas, chipotle—

"Can I get you something to drink?" the waitress asked.

"Yes," Bev said brightly, looking at the waitress's name tag. "I'd like some sangria, Carmelita."

Carmelita nodded and left, and Bev looked around the room, thinking, I'll drink my sangria and watch the other diners, eavesdrop on their conversations, but she was the only person in the broad tiled room. It faced the patio, and through the glass doors the rain, sleet now, drove sharply against the terracotta pots of cactus outside, the stacked tables and chairs, the collapsed umbrellas.

She had envisioned herself having lunch out on the patio, sitting in the sun under one of those umbrellas, looking out at the desert and listening to a mariachi band. The music coming over the loudspeakers was Christmas carols. As she listened, "Let It Snow" came to an end and the Supremes began to sing "White Christmas."

"What would cloud-seeding be listed under?" Howard had asked her one year when there was still no snow by the twenty-second, coming into the dining room, where she was wrapping presents, with the phone book.

"You are *not* hiring a cloud seeder," she had laughed.

"Would it be under 'clouds' or 'rainmaker'?" he'd asked mock-seriously. "Or 'seeds'?" And when it had finally snowed on the twenty-fourth, he had acted as if he was personally responsible.

"You did *not* cause this, Howard," she had told him.

"How do you know?" he'd laughed, catching her into his arms.

I can't stand this, Bev thought, looking frantically around the dining room for Carmelita and her sangria. How do other people do it? She knew lots of widows, and they all seemed fine. When people mentioned their husbands, when they talked about them in the past tense, they were able to stand there, to smile back, to talk about them. Doreen Matthews had even said, "Now that Bill's gone, I can finally have all pink ornaments on the Christmas tree. I've always wanted to have a pink tree, but he wouldn't hear of it."

"Here's your sangria," Carmelita said, still looking concerned. "Would you like some tortilla chips and salsa?"

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"Yes, thank you," Bev said brightly. "And I think I'll have the chicken enchiladas."

Carmelita nodded and disappeared again. Bev took a gulp of her sangria and got her guidebook out of her bag. She would have a nice lunch and then go sightseeing. She opened the book to Area Attractions. "Pueblo de San Ildefonso." No, that would involve a lot of walking around outdoors, and it was still sleeting outside the window.

"Petroglyphs National Monument." No, that was down near Albuquerque, where it was snowing. "El Santuario de Chimayo. 28 mi. north of Santa Fe on Hwy. 76. Historic weaving center, shops, chapel dubbed 'American Lourdes.' The dirt in the anteroom beside the altar is reputed to have healing powers when rubbed on the afflicted part of the body."

But I hurt all over, she thought.

"Other attractions include five nineteenth-century reredos, a carving of Santo Nino de Atocha, carved wooden altarpiece. (See also Lagrima, p. 98.)"

She turned the page to ninety-eight. "Chapel of Our Lady of Perpetual Sorrow, Lagrima, 28 mi. SE of Santa Fe on Hwy 41. 16th century adobe mission church. In 1968 the statue of the Virgin Mary in the transept was reported to shed healing tears."

Healing tears, holy dirt, and wasn't there supposed to be a miraculous staircase right here in town? Yes, there it was. The Loretto Chapel. "Open 10-5 Apr-Oct, closed Nov-Mar."

It would have to be Chimayo. She got out the road map the car rental place had given her, and when Carmelita came with the chips and salsa, she said, "I'm thinking of driving up to Chimayo. What's the best route?"

"Today?" Carmelita said, dismayed. "That's not a good idea. The road's pretty curvy, and we just got a call from Taos that it's really snowing hard up there."

"How about one of the pueblos then?"

She shook her head. "You have to take dirt roads to get there, and it's getting very icy. You're better off doing something here in town. There's a Christmas Eve mass at the cathedral at midnight," she added helpfully.

But I need something to do this afternoon, Bev thought, bending over the guidebook again. Ind[illegible] Research Center—open weekends only. El Rancho de las Golondrinas [illegible]-closed Nov-Feb. Santa Fe Historical Museum—closed Dec 24–Jan 1.

The Georgia O'Keeffe Museum—open daily.

Perfect, Bev thought, reading the entry: "Houses world's largest permanent collection of O'Keeffe's work. A major American artist, O'Keeffe lived in the Santa Fe area for many years. When she first arrived in 1929, she was physically and psychologically ill, but the dry, hot New Mexico climate healed and inspired her, and she painted much of her finest work here."

Perfect. Sun-baked paintings of cow skulls and giant tropical flowers and desert buttes. "Open daily. 10 A.M.–6 P.M. 217 Johnson St."

She looked up the address on her map. Only three blocks off the Plaza, within easy walking distance even in this weather. Perfect. When Carmelita brought her enchiladas, she attacked them eagerly.

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"Did you find somewhere to go in town?" Carmelita asked curiously.

"Yes, the Georgia O'Keeffe Museum."

"Oh," Carmelita said and vanished again. She was back almost immediately. "I'm sorry, *señora,* but they're closed."

"Closed? It said in the guidebook the museum's open daily."

"It's because of the snow."

"Snow?" Bev said and looked past her to the patio where the sleet had turned to a heavy, slashing white.

At 1:20, Jim called from the airport to tell them Kindra's and David's planes had both been delayed, and a few minutes later the bakery delivered the wedding cake. "No, no," Stacey said, "that's supposed to go to the country club. That's where the reception is."

"We tried," the driver said. "We couldn't get through. We can either leave it here or take it back to the bakery, take your pick. If we can *get* back to the bakery. Which I doubt."

"Leave it here," Stacey said. "Jim can take it over when he gets here."

"But you just heard him," Paula said. "If the truck can't get through, Jim won't be able to—" The phone rang.

It was the florist, calling to say they weren't going to be able to deliver the flowers. "But you have to," Stacey said. "The wedding's at five. Tell them they have to, Paula," and handed the phone to her.

"Isn't there any way you can get here?" Paula asked.

"Not unless there's a miracle," the florist said. "Our truck's in a ditch out at Pawnee, and there's no telling how long it'll take a tow truck to get to it. It's a skating rink out there."

"Jim will have to go pick up the flowers when he gets back with Kindra and David," Stacey said blithely when Paula told her the bad news. "He can do it on his way to the country club. Is the string quartet here yet?"

"No, and I'm not sure they'll be able to get here. The florist said the roads are really icy," Paula said, and the viola player walked in.

"I told you," Stacey said happily, "it'll all work out. Did I tell you, they're going to play Boccherini's 'Minuet No.8' for the wedding march?" and went to get the candles for the altar stands.

Paula went over to the viola player, a lanky young guy. He was brushing snow off his viola case. "Where's the rest of the quartet?"

"They're not here yet?" he said, surprised. "I had a lesson to give in town and told 'em I'd catch up with them." He sat down to take off his snow-crusted boots. "And then my car ended up in a snowbank, and I had to walk the last mile and a half." He grinned up at her, panting. "It's times like these I wish I played the piccolo. Although," he said, looking her up and down, "there are compensations. Please tell me you're not the bride."

"I'm not the bride," she said. Even though I wish I was.

"Great!" he said and grinned at her again. "What are you doing after the wedding?"

"I'm not sure there's going to be one. Do you think the other musicians got stuck on the way here, too?"

He shook his head. "I would have seen them." He pulled out a cell phone and punched buttons. "Shep? Yeah, where are you?" There was a

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pause. "That's what I was afraid of. What about Leif?" Another pause. "Well, if you find him, call me back." He flipped the phone shut. "Bad news. The violins were in a fender bender and are waiting for the cops. They don't know where the cello is. How do you feel about a viola solo of 'Minuet No.8'?"

Paula went to inform Stacey. "The police can bring them out," Stacey said blithely and handed Paula the white candles for the altar stands. "The candlelight on the snow's going to be just beautiful."

At 1:48 P.M. Eastern Standard Time, snow flurries were reported at Sunset Point in the Florida Keys.

"I get to officially freak out now, right?" Chin asked Nathan. "Jeez, it really *is* the discontinuity you said would happen!"

"We don't know that yet," Nathan said, looking at the National Weather Service map, which was now entirely blue, except for a small spot near Fargo and another one in north-central Texas that Nathan thought was Waco and Chin was convinced was the president's ranch in Crawford.

"What do you mean, we don't know that yet? It's snowing in Barcelona. It's snowing in Moscow."

"It's supposed to be snowing in Moscow. Remember Napoleon? It's not unusual for it to be snowing in over two-thirds of these places reporting in: Oslo, Katmandu, Buffalo—"

"Well, it's sure as hell unusual for it to be snowing in Beirut," Chin said, pointing to the snow reports coming in, "and Honolulu. I don't care what you say, I'm freaking out."

"You can't," Nathan said, superimposing an isobaric grid over the map. "I need you to feed me the temp readings."

Chin started over to his terminal and then came back. "What do *you* think?" he asked seriously. "Do you think it's a discontinuity?"

There was nothing else it could be. Winter storms were frequently very large, the February 1994 European storm had been huge, and the one in December 2002 had covered over a third of the U.S., but there'd never been one that covered the entire continental United States. And Mexico and Manitoba and Belize, he thought, watching the snowfall reports coming in.

In addition, snow was falling in six locations where it had never fallen before, and in twenty-eight like Yuma, Arizona, where it had snowed only once or twice in the last hundred years. New Orleans had a foot of snow, for God's sake. And it was snowing in Guatemala.

And it wasn't behaving like any storm he'd ever seen. According to the charts, snow had started simultaneously in Springfield, Illinois, Hoodoo, Tennessee, Park City, Utah, and Branford, Connecticut, and spread in a completely random pattern. There was no center to the storm, no leading edge, no front.

And no let-up. No station had reported the snow stopping, or even diminishing, and new stations were reporting in all the time. At this rate, it would be snowing everywhere by—he made a rapid calculation—five o'clock.

"Well?" Chin said. "Is it?" He looked really frightened.

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And him freaking out is the last thing I need with all this data to feed in, Nathan thought. "We don't have enough data to make a determination yet," he said.

"But you think it might be," Chin persisted. "Don't you? You think all the signs are there?"

Yes, Nathan thought. "Definitely not," he said. "Look at the TV."

"What about it?"

"There's one sign that's not present." He gestured at the screen. "No logo."

"No what?"

"No logo. Nothing qualifies as a full-fledged crisis until the cable newschannels give it a logo of its own, preferably with a colon. You know, *O.J.: Trial of the Century* or *Sniper at Large* or *Attack: Iraq*." He pointed at Dan Rather standing in thickly falling snow in front of the White House. "Look, it says *Breaking News,* but there's no logo. So it can't be a discontinuity. So feed me those temps. And then go see if you can scare up a couple more TVs. I want to get a look at exactly what's going on out there. Maybe that'll give us some kind of clue."

Chin nodded, looking reassured, and went to get the temp readings. They were all over the place, too, from eighteen below in Saskatoon to thirty-one above in Ft. Lauderdale. Nathan ran them against average temps for mid-December and then highs and lows for the twenty-fourth, looking for patterns, anomalies.

Chin wheeled in a big-screen TV on an AV cart, along with Professor Adler's portable, and plugged them in. "What do you want these on?" he asked.

"CNN, the Weather Channel, Fox—" Nathan began.

"Oh, no," Chin said.

"What? What is it?"

"Look," Chin said and pointed to Professor Adler's portable. Wolf Blitzer was standing in the snow in front of the Empire State Building. At the lower right-hand corner was the CNN symbol. And in the upper left-hand corner: *Storm of the Century.*

As soon as Pilar had Miguel's things packed, she checked on the TV again.

"—resulting in terrible road conditions," the reporter was saying. "Police are reporting accidents at the intersection of Sepulveda and Figueroa, the intersection of San Pedro and Whittier, the intersection of Hollywood and Vine," while accident alerts crawled across the bottom of the screen. "We're getting reports of a problem on the Santa Monica Freeway just past the Culver City exit and . . . this just in, the northbound lanes of the 110 are closed due to a five-car accident. Travelers are advised to take alternate routes."

The phone rang. Miguel ran into the kitchen to answer it. "Hi, Daddy, it's snowing," he shouted into the receiver, "We're going outside and make a snowman," and then said, "Okay," and handed it to Pilar.

"Go watch cartoons and let Mommy talk to Daddy," she said and handed him the remote. "Hello, Joe."

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"I want you to bring Miguel down now," her ex-husband said without preamble, "before the snow gets bad."

"It's already bad," Pilar said, standing in the door of the kitchen watching Miguel flip through the channels:

"—really slick out here—"

"—advised to stay home. If you don't have to go someplace, folks, don't."

"—treacherous conditions—"

"I'm not sure taking him out in this is a good idea," Pilar said. "The TV's saying the roads are really slick, and—"

"And I'm saying bring him down here now," Joe said nastily. "I know what you're doing. You think you can use a little snow as an excuse to keep my son away from me on Christmas."

"I am not," she protested. "I'm just thinking about Miguel's safety. I don't have snow tires—"

"Like hell you're thinking about the kid! You're thinking this is a way to do me out of my rights. Well, we'll see what my lawyer has to say about that. I'm calling him *and* the judge and telling them what you're up to, and that I'm sick of this crap, I want full custody. And then I'm coming up there myself to get him. Have him ready when I get there!" he shouted and hung up the phone.

At 2:22 P.M., Luke's mother called on her cell phone to say she was going to be late and to go ahead and start the goose. "The roads are terrible, and people do *not* know how to drive. This red Subaru ahead of me just *swerved* into my lane and—"

"Mom, Mom," Luke cut in, "the goose. What do you mean, start the goose? What do I have to do?"

"Just put it in the oven. Shorty and Madge should be there soon, and she can take over. All you have to do is get it started. Take the bag of giblets out first. Put an aluminum foil tent over it."

"An aluminum-foil what?"

"Tent. Fold a piece of foil in half and lay it over the goose. It keeps it from browning too fast."

"How big a piece?"

"Big enough to cover the goose. And don't tuck in the edges."

"Of the oven?"

"Of the tent. You're making this much harder than it is. You wouldn't *believe* how many cars there are off the road, and every one of them's an SUV. It serves them right. They think just because they've got four-wheel drive, they can go ninety miles an hour in a *blizzard*—"

"Mom, Mom, what about stuffing? Don't I have to stuff the goose?"

"No. Nobody does stuffing inside the bird anymore. Salmonella. Just put the goose in the roasting pan and stick it in the oven. At 350 degrees."

I can do that, Luke thought, and did. Ten minutes later he realized he'd forgotten to put the aluminum foil tent on. It took him three tries to get a piece the right size, and his mother hadn't said whether the shiny or the dull side should be facing out, but when he checked the goose twenty minutes later, it seemed to be doing okay. It smelled good, and there were already juices forming in the pan.

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After Pilar hung up with Joe, she sat at the kitchen table a long time, trying to think which was worse, letting Joe take Miguel out into this snowstorm or having Miguel witness the fight that would ensue if she tried to stop him. "Please, please . . ." she murmured, without even knowing what she was praying for.

Miguel came into the kitchen and climbed into her lap. She wiped hastily at her eyes. "Guess what, honey?" she said brightly. "Daddy's going to come get you in a little bit. You need to go pick out which toys you want to take."

"Hunh-unh," Miguel said, shaking his head.

"I know you wanted to make a snowman," she said, "but guess what? It's snowing in Escondido, too. You can make a snowman with Daddy."

"Hunh-*unh,*" he said, climbing down off her lap and tugging on her hand. He led her into the living room.

"What, honey?" she said, and he pointed at the TV. On it, the Santa Monica reporter was saying, "—the following road closures: I-5 from Chula Vista to Santa Ana, I-15 from San Diego to Barstow, Highway 78 from Oceanside to Escondido—"

Thank you, she murmured silently, thank you. Miguel ran out to the kitchen and came back with a piece of construction paper and a red crayon. "Here," he said, thrusting them at Pilar. "You have to write Santa. So he'll know to bring my presents here and not Daddy's."

By ordering sopapillas and then Mexican coffee, Bev managed to make lunch last till nearly two o'clock. When Carmelita brought the coffee, she looked anxiously out at the snow piling up on the patio and then back at Bev, so Bev asked for her check and signed it so Carmelita could leave, and then went back up to her room for her coat and gloves.

Even if the shops were closed, she could window-shop, she told herself, she could look at the Navajo rugs and Santa Clara pots and Indian jewelry displayed in the stores, but the snowstorm was getting worse. The luminarias that lined the walls were heaped with snow, the paper bags that held the candles sagging under the soggy weight.

They'll never get them lit, Bev thought, turning into the Plaza.

By the time she had walked down one side of it, the snow had become a blizzard, it was coming down so hard you couldn't see across the Plaza, and there was a cutting wind. She gave up and went back to the hotel.

In the lobby, the staff, including the front desk clerk and Carmelita in her coat and boots, was gathered in front of the TV looking at a weather map of New Mexico. ". . . currently snowing in most of New Mexico," the announcer was saying, "including Gallup, Carlsbad, Ruidoso, and Roswell. Travel advisories out for central, western, and southern New Mexico, including Lordsburg, Las Cruces, and Truth or Consequences. It looks like a white Christmas for most of New Mexico, folks."

"You have two messages," the front desk clerk said when he saw her. They were both from Janice, and she phoned again while Bev was taking her coat off up in her room.

"I just saw on TV that it's snowing in Santa Fe, and you said you were going sightseeing," Janice said. "I just wondered if you were okay."

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"I'm here at the hotel," Bev said. "I'm not going anywhere."

"*Good,*" Janice said, relieved. "Are you watching TV? The weathermen are saying this isn't an ordinary storm. It's some kind of extreme megastorm. We've got three feet here. The power's out all over town, and the airport just closed. I hope you're able to get home. Oops, the lights just flickered. I'd better go hunt up some candles before the lights go off," she said, and hung up.

Bev turned on the TV. The local channel was listing closings— "The First United Methodist Church Christmas pageant has been cancelled and there will be no *Posadas* tonight at Our Lady of Guadalupe. Canyon Day Care Center will close at three P.M. . . ."

She clicked the remote. CNBC was discussing earlier Christmas Eve snowstorms, and on CNN, Daryn Kagan was standing in the middle of Fifth Avenue in a snowdrift. "This is usually the busiest shopping day of the year," she said, "but as you can see—"

She clicked the remote, looking for a movie to watch. Howard would have loved this, she thought involuntarily. He would have been in his element.

She clicked quickly through the other channels, trying to find a film, but they were all discussing the weather. "It looks like the whole country's going to get a white Christmas this year," Peter Jennings was saying, "whether they want it or not."

You'd think there'd be a Christmas movie on, Bev thought grimly, flipping through the channels again. It's Christmas Eve. *Christmas in Connecticut* or *Holiday Inn*. Or *White Christmas*.

Howard had insisted on watching it every time he came across it with the remote, even if it was nearly over. "Why are you watching that?" she'd ask, coming in to find him glued to the next-to-the-last scene. "We own the video."

"Shh," he'd say. "It's just getting to the good part," and he'd lean forward to watch Bing Crosby push open the barn doors to reveal fake-looking snow falling on the equally fake-looking set.

When he came into the kitchen afterward, she'd say sarcastically, "How'd it end this time? Did Bing and Rosemary Clooney get back together? Did they save the General's inn and all live happily ever after?"

But Howard would refuse to be baited. "They got a white Christmas," he'd say happily and go off to look out the windows at the clouds.

Except for news about the storm, there was nothing at all on except an infomercial selling a set of Ginsu knives. How appropriate, she thought, and sat back on the bed to watch it.

At 2:08, the weight of the new loose snow triggered a huge avalanche in the "totally extreme slopes" area near Breckenridge, knocking down huge numbers of Ponderosa pines and burying everything in its path, but not Kent and Bodine, who were still in their Honda, trying to keep warm and survive on a box of Tic-Tacs and an old donut Kent found in the glove compartment.

By two-thirty, Madge and Shorty still weren't there, so Luke checked

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the goose. It seemed to be cooking okay, but there was an awful lot of juice in the pan. When he checked it again half an hour later, there was over an inch of the stuff.

That couldn't be right. The last time he'd gotten stuck with having the Christmas Eve dinner, the turkey had only produced a few tablespoons of juice. He remembered his mom pouring them off to make the gravy.

He tried his mom. Her cell phone said, "Caller unavailable," which meant her batteries had run down, or she'd turned it off. He tried Aunt Madge's. No answer.

He dug the plastic and net wrapping the goose had come in out of the trash, flattened it out, and read the instructions: "Roast uncovered at 350° for twenty-five minutes per pound."

Uncovered. That must be the problem, the aluminum foil tent. It wasn't allowing the extra juice to evaporate. He opened the oven and removed it. When he checked the goose again fifteen minutes later, it was sitting in two inches of grease, and even though, according to the wrapping, it still had three hours to go, the goose was getting brown and crispy on top.

At 2:51 P.M., Joe Gutierrez slammed out of his house and started up to get Miguel. He'd been trying to get his goddamned lawyer on the phone ever since he'd hung up on Pilar, but the lawyer wasn't answering.

The streets were a real mess, and when Joe got to the I-15 entrance ramp, there was a barricade across it. He roared back down the street to take Highway 78, but it was blocked, too. He stormed back home and called Pilar's lawyer, but he didn't answer either. He then called the judge, using the unlisted cell phone number he'd seen on his lawyer's palm pilot.

The judge, who had been stuck waiting for AAA in a Starbucks at the Bakersfield exit, listening to Harry Connick, Jr., destroy "White Christmas" for the last three hours, was not particularly sympathetic, especially when Joe started swearing at him.

Words were exchanged, and the judge made a note to himself to have Joe declared in contempt of court. Then he called AAA to see what was taking so long, and when the operator told him he was nineteenth in line, and it would be at least another four hours, he decided to revisit the entire custody agreement.

By three o'clock, all the networks and cable newschannels had logos. ABC had *Winter Wonderland,* NBC had *Super Storm,* and Fox News had *Winter Wallop*. CBS and MSNBC had both gone with *White Christmas,* flanked by a photo of Bing Crosby (MSNBC's wearing the Santa Claus hat from the movie).

The Weather Channel's logo was a changing world map that was now two-thirds white, and snow was being reported in Karachi, Seoul, the Solomon Islands, and Bethlehem, where Christmas Eve services (usually canceled due to Israeli-Palestinian violence) had been canceled due to the weather.

At 3:15 P.M., Jim called Paula from the airport to report that Kindra

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and David's flights had both been delayed indefinitely. "And the USAir guy says they're shutting the airport in Houston down. Dallas International's already closed, and so are JFK and O'Hare. How's Stacey?"

Incorrigible, Paula thought. "Fine," she said. "Do you want to talk to her?"

"No. Listen, tell her I'm still hoping, but it doesn't look good."

Paula told her, but it didn't have any effect. "Go get your dress on," Stacey ordered her, "so the minister can run through the service with you, and then you can show Kindra and David where to stand when they get here."

Paula went and put on her bridesmaid dress, wishing it wasn't sleeveless, and they went through the rehearsal with the viola player, who had changed into his tux to get out of his snow-damp clothes, acting as best man.

As soon as they were done, Paula went into the vestry to get a sweater out of her suitcase. The minister came in and shut the door. "I've been trying to talk to Stacey," she said. "You're going to *have* to cancel the wedding. The roads are getting really dangerous, and I just heard on the radio they've closed the interstate."

"I know," Paula said.

"Well, she doesn't. She's convinced everything's going to work out."

And it might, Paula thought. After all, this is Stacey.

The viola player poked his head in the door. "Good news," he said.

"The string quartet's here?" the minister said.

"Jim's here?" Paula said.

"No, but Shep and Leif found the cello player. He's got frostbite, but otherwise he's okay. They're taking him to the hospital." He gestured toward the sanctuary. "Do you want to tell the Queen of Denial, or shall I?"

"I will," Paula said and went back into the sanctuary. "Stacey—"

"Your dress looks beautiful!" Stacey cried and dragged her over to the windows. "Look how it goes with the snow!"

When the bell rang at a quarter to four, Luke thought, Finally! Mom! and literally ran to answer the door. It was Aunt Lulla. He looked hopefully past her, but there was no one else pulling into the driveway or coming up the snow-packed street. "You don't know anything about cooking a goose, do you?" he asked.

She looked at him a long, silent moment and then handed him the plate of olives she'd brought and took off her hat, scarf, gloves, plastic boots, and old-lady coat. "Your mother and Madge were always the domestic ones," she said, "I was the theatrical one," and while he was digesting that odd piece of information, "Why did you ask? Is your goose cooked?"

"Yes," he said and led her into the kitchen and showed her the goose, which was now swimming in a sea of fat.

"Good God!" Aunt Lulla said, "where did all that grease come from?"

"I don't know," he said.

"Well, the first thing to do is pour some of it off before the poor thing drowns."

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"I already did," Luke said. He took the lid off the saucepan he'd poured the drippings into earlier.

"Well you need to pour off some more," she said practically, "and you'll need a larger pan. Or maybe we should just pour it down the sink and get rid of the evidence."

"It's for the gravy," he said, rummaging in the cupboard under the sink for the big pot his mother had given him to cook spaghetti in.

"Oh, of course," she said, and then thoughtfully, "I *do* know how to make gravy. Alec Guinness taught me."

Luke stuck his head out of the cupboard. "Alec Guinness taught you to make *gravy?*"

"It's not really all that difficult," she said, opening the oven door and looking speculatively at the goose. "You wouldn't happen to have any wine on hand, would you?"

"Yes." He emerged with the pot. "Why? Will wine counteract the grease?"

"I have no idea," she said, "but one of the things I learned when I was playing off-Broadway was that when you're facing a flop or an opening night curtain, it helps to be a little sloshed."

"You played off-Broadway?" Luke said. "Mom never told me you were an actress."

"I wasn't," she said, opening cupboard doors. She pulled out two wine glasses. "You should have seen my reviews."

By 4:00 P.M., all the networks and cable newschannels had changed their logos to reflect the worsening situation. ABC had *MegaBlizzard,* NBC had *MacroBlizzard,* and CNN had *Perfect Storm,* with a graphic of a boat being swamped by a gigantic wave. CBS and MSNBC had both gone with *Ice Age,* CBS's with a question mark, MSNBC's with an exclamation point and a drawing of the Abominable Snowman. And Fox, ever the "fair and balanced" news network, was proclaiming, *End of the World!*

"*Now* can I freak out?" Chin asked.

"No," Nathan said, feeding in snowfall rates. "In the first place, it's Fox. In the second place, a discontinuity does not necessarily mean the end of the wo—"

The lights flickered. They both stopped and stared at the overhead fluorescents. They flickered again.

"Backup!" Nathan shouted, and they both dived for their terminals, shoved in zip drives, and began frantically typing, looking anxiously up at the lights now and then.

Chin popped the zip disk out of the hard drive. "You were saying that a discontinuity isn't necessarily the end of the world?"

"Yes, but losing this data would be. From now on we back up every fifteen minutes."

The lights flickered again, went out for an endless ten seconds, and came back on again to Peter Jennings saying, "—Huntsville, Alabama, where thousands are without power. I'm here at Byrd Middle School, which is serving as a temporary shelter." He stuck the microphone under the nose of a woman holding a candle. "When did the power go off?" he asked.

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"About noon," she said. "The lights flickered a couple of times before that, but both times the lights came back on, and I thought we were okay, and then I went to fix lunch, and they went off, like that—" she snapped her fingers, "without any warning."

"We back up every five minutes," Nathan said, and to Chin, who was pulling on his parka, "Where are you going?"

"Out to my car to get a flashlight."

He came back in ten minutes later, caked in snow, his ears and cheeks bright red. "It's four feet deep out there. Tell me again why I shouldn't freak out," he said, handing the flashlight to Nathan.

"Because I don't think this is a discontinuity," Nathan said. "I think it's just a snowstorm."

"Just a snowstorm?" Chin said, pointing at the TVs, where red-eared, red-cheeked reporters were standing in front of, respectively, a phalanx of snowplows on the Boardwalk in Atlantic City, a derailed train in Casper, and a collapsed Wal-Mart in Biloxi, "—from the weight of a record fifty-eight inches of snow," Brit Hume was saying. "Luckily, there were no injuries here. In Cincinnati, however—"

"*Fifty-eight* inches," Chin said. "In *Mississippi*. What if it keeps on snowing and snowing forever till the whole world—?"

"It can't," Nathan said. "There isn't enough moisture in the atmosphere, and no low pressure system over the Gulf to keep pumping moisture up across the lower United States. There's no low pressure system at all, and no ridge of high pressure to push against it, no colliding air masses, nothing. Look at this. It started in four different places hundreds of miles from each other, in different latitudes, different altitudes, none of them along a ridge of high pressure. This storm isn't following any of the rules."

"But doesn't that prove it's a discontinuity?" Chin asked nervously. "Isn't that one of the signs, that it's completely different from what came before?"

"The *climate* would be completely different, the *weather* would be completely different, *not* the laws of physics." He pointed to the world map on the mid-right-hand screen. "If this were a discontinuity, you'd see a change in ocean current temps, a shift in the jet stream, changes in wind patterns. There's none of that. The jet stream hasn't moved, the rate of melting in the Antarctic is unchanged, the Gulf Stream's still there. El Niño's still there. *Venice* is still there."

"Yeah, but it's snowing on the Grand Canal," Chin said. "So what's causing the mega-storm?"

"That's just it. It's not a mega-storm. If it were, there'd be accompanying ice-storms, hurricane-force winds, microbursts, tornadoes, none of which has shown up on the data. As near as I can tell, all it's doing is snowing." He shook his head. "No, something else is going on."

"What?"

"I have no idea." He stared glumly at the screens. "Weather's a remarkably complex system. Hundreds, thousands of factors we haven't figured in could be having an effect: cloud dynamics, localized temperature variations, pollution. Or it could be something we haven't even considered: the effects of de-icers on highway albedo, beach erosion, sunspot activity. Or

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the effect on electromagnetic fields of playing 'White Christmas' hundreds of times on the radio this week."

"Four thousand nine hundred and thirty-three," Chin said.

"What?"

"That's how many times Bing Crosby's 'White Christmas' is played the two weeks before Christmas, with an additional nine thousand and sixty-two times by other artists. Including Otis Redding, U2, Peggy Lee, the Three Tenors, and the Flaming Lips. I read it on the internet."

"Nine thousand and sixty-two," Nathan said. "That's certainly enough to affect something, all right."

"I know what you mean," Chin said. "Have you heard Eminem's new rap version?"

By 4:15 P.M., the spaghetti pot was two-thirds full of goose grease, Luke's mother and Madge and Shorty still weren't there, and the goose was nearly done. Luke and Lulla had decided after their third glass of wine apiece to make the gravy.

"And put the tent back on," Lulla said, sifting flour into a bowl. "One of the things I learned when I was playing the West End is that uncovered is not necessarily better." She added a cup of water. "Particularly when you're doing Shakespeare."

She shook in some salt and pepper. "I remember a particularly ill-conceived nude *Macbeth* I did with Larry Olivier." She thrust her hand out dramatically. "'Is that a dagger that I see before me?' should *not* be a laugh line. Richard taught me how to do this," she said, stirring the mixture briskly with a fork, "It gets the lumps out."

"Richard? Richard *Burton?*"

"Yes. Adorable man. Of course he drank like a fish when he was depressed—this was after Liz left him for the second time—but it never seemed to affect his performance in bed *or* in the kitchen. Not like Peter."

"Peter? Peter Ustinov?"

"O'Toole. Here we go." Lulla poured the flour mixture into the hot drippings. It disappeared. "It takes a moment to thicken up," she said hopefully, but after several minutes of combined staring into the pot, it was no thicker.

"I think we need more flour," she said, "and a larger bowl. A much larger bowl. And another glass of wine."

Luke fetched them, and after a good deal of stirring, she added the mixture to the drippings, which immediately began to thicken up. "Oh, good," she said, stirring, "as John Gielgud used to say, 'If at first you don't succeed' . . . oh, dear."

"What did he say that for—oh, dear," Luke said, peering into the pot where the drippings had abruptly thickened into a solid, globular mass.

"That's not what gravy's supposed to look like," Aunt Lulla said.

"No," Luke said. "We seem to have made a lard ball."

They both looked at it awhile.

"I don't suppose we could pass it off as a very large dumpling," Aunt Lulla suggested.

"No," Luke said, trying to chop at it with the fork.

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"And I don't suppose it'll go down the garbage disposal. Could we stick sesame seeds on it and hang it on a tree and pretend it was a suet ball for the birds?"

"Not unless we want PETA and the Humane Society after us. Besides, wouldn't that be cannibalism?"

"You're right," Aunt Lulla said. "But we've got to do something with it before your mother gets here. I suppose Yucca Mountain's too far away," she said thoughtfully. "You wouldn't have any acid on hand, would you?"

At 4:23 P.M., Slim Rushmore, on KFLG out of Flagstaff, Arizona, made a valiant effort to change the subject on his talk radio show to school vouchers, usually a sure-fire issue, but his callers weren't having any of it. "This snow is a clear sign the Apocalypse is near," a woman from Colorado Springs informed him. "In the Book of Daniel, it says that God will send snow 'to purge and to make them white, even to the time of the end,' and the Book of Psalms promises us 'snow and vapours, stormy wind fulfilling his word,' and in the Book of Isaiah . . ."

After the fourth Scripture (from Job: "For God saith to the snow, Be thou on the earth") Slim cut her off and took a call from Dwayne in Poplar Bluffs.

"You know what started all this, don't you?" Dwayne said belligerently. "When the commies put fluoride in the water back in the fifties."

At 4:25 P.M., the country club called the church to say they were closing, none of the food and only two of the staff could get there, and anybody who was still trying to have a wedding in this weather was crazy. "I'll tell her," Paula said and went to find Stacey.

"She's in putting on her wedding dress," the viola player said.

Paula moaned.

"Yeah, I know," he said. "I tried to explain to her that the rest of the quartet was *not* coming, but I didn't get anywhere." He looked at her quizzically. "I'm not getting anywhere with you either, am I?" he asked, and Jim walked in.

He was covered in snow. "The car got stuck," he said.

"Where are Kindra and David?"

"They closed Houston," he said, pulling Paula aside, "and Newark. And I just talked to Stacey's mom. She's stuck in Lavoy. They just closed the highway. There's no way she can get here. What are we going to do?"

"You have to tell her the wedding has to be called off," Paula said. "You don't have any other option. And you have to do it now, before the guests try to come to the church."

"You obviously haven't been out there lately," he said. "Trust me, nobody's going to come out in that."

"Then you clearly have to cancel."

"I know," he said worriedly. "It's just . . . she'll be so disappointed."

Disappointed is not the word that springs to mind, Paula thought, and realized she had no idea how Stacey would react. She'd never seen her not get her way. I wonder what she'll do, she thought curiously, and started back into the vestry to change out of her bridesmaid dress.

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"Wait," Jim said, grabbing her hand. "You have to help me tell her."

This is asking way too much, Paula thought. I want you to marry me, not her. "I—" she said.

"I can't do this without you," he said. "Please?"

She extricated her hand. "Okay," she said, and they went into the changing room, where Stacey was in her wedding dress, looking at herself in the mirror.

"Stacey, we have to talk," Jim said, after a glance at Paula. "I just heard from your mother. She's not going to be able to get here. She's stuck at a truck stop outside Lavoy."

"She can't be," Stacey said to her reflection. "She's bringing my veil." She turned to smile at Paula. "It was my great-grandmother's. It's lace, with this snowflake pattern."

"Kindra and David can't get here either," Jim said. He glanced at Paula and then plunged ahead. "We're going to have to reschedule the wedding."

"Reschedule?" Stacey said as if she'd never heard the word before. Which she probably hasn't, Paula thought. "We can't reschedule. A Christmas Eve wedding has to be on Christmas Eve."

"I know, honey, but—"

"Nobody's going to be able to get here," Paula said. "They've closed the roads."

The minister came in. "The governor's declared a snow emergency and a ban on unnecessary travel. You've decided to cancel?" she said hopefully.

"*Cancel?*" Stacey said, adjusting her train. "What are you talking about? Everything will be fine."

And for one mad moment, Paula could almost see Stacey pulling it off, the weather magically clearing, the rest of the string quartet showing up, the flowers and Kindra and David and the veil all arriving in the next thirty-five minutes. She looked over at the windows. The snow, reflected softly in the candlelight, was coming down harder than ever.

"We don't have any other choice than to reschedule," Jim said. "Your mother can't get here, your maid of honor and my best man can't get here—"

"Tell them to take a different flight," Stacey said.

Paula tried. "Stacey, I don't think you realize, this is a major snowstorm. Airports all over the country are closed—"

"Including here," the viola player said, poking his head in. "It was just on the news."

"Well, then, go get them," Stacey said, adjusting the drape of her skirt.

Paula'd lost the thread of this conversation. "Who?"

"Kindra and David." She adjusted the neckline of her gown.

"To *Houston?*" Jim said, looking helplessly at Paula.

"Listen, Stacey," Paula said, taking her firmly by the shoulders, "I know how much you wanted a Christmas Eve wedding, but it's just not going to work. The roads are impassable. Your flowers are in a ditch, your mother's trapped at a truck stop—"

"The cello player's in the hospital with frostbite," the viola player put in.

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Paula nodded. "And you don't want anyone else to end up there. You have to face facts. You can't have a Christmas Eve wedding."

"You could reschedule for Valentine's Day," the minister said brightly. "Valentine weddings are very nice. I've got two weddings that day, but I could move one up. Yours could still be in the evening," but Paula could tell Stacey had stopped listening at "you can't have—"

"*You* did this," Stacey snapped at Paula. "You've always been jealous of me, and now you're taking it out on me by ruining my wedding."

"Nobody's ruining anything, Stacey," Jim said, stepping between them. "It's a snowstorm."

"Oh, so I suppose it's *my* fault!" Stacey said. "Just because I wanted a winter wedding with snow—"

"It's nobody's fault," Jim said sternly. "Listen, I don't want to wait either, and we don't have to. We can get married right here, right now."

"Yeah," the viola player said. "You've got a minister." He grinned at Paula. "You've got two witnesses."

"He's right," Jim said. "We've got everything we need right here. You're here, *I'm* here, and that's all that really matters, isn't it, not some fancy wedding?" He took her hands in his. "Will you marry me?"

And what woman could resist an offer like that? Paula thought. Oh, well, you knew when you got on the plane that he was going to marry her.

"Marry you," Stacey repeated blankly, and the minister hurried out, saying, "I'll get my book. And my robe."

"Marry you?" Stacey said. "*Marry you?*" She wrenched free of his grasp. "Why on earth would I marry a *loser* who won't even do one simple thing for me? I *want* Kindra and David here. I *want* my flowers. I *want* my veil. What is the *point* of *marrying* you if I can't have what I want?"

"I thought you wanted me," Jim said dangerously.

"*You?*" Stacey said in a tone that made both Paula and the viola player wince. "I *wanted* to walk down the aisle at twilight on Christmas Eve," she waved her arm in the direction of the windows, "with candlelight reflecting off the windowpanes and snow falling outside." She turned, snatching up her train, and looked at him. "Will I *marry* you? Are you *kidding?*"

There was a short silence. Jim turned and looked seriously at Paula. "How about you?" he said.

At six o'clock on the dot, Madge and Shorty, Uncle Don, Cousin Denny, and Luke's mom all arrived. "You poor darling," she whispered to Luke, handing him the green bean casserole and the sweet potatoes, "stuck all afternoon with Aunt Lulla. Did she talk your ear off?"

"No," he said. "We made a snowman. Why didn't you tell me Aunt Lulla had been an actress?"

"An *actress?*" she said, handing him the cranberry sauce. "Is that what she told you? Don't tip it, it'll spill. Did you have any trouble with the goose?" She opened the oven and looked at it, sitting in its pan, brown and crispy and done to a turn. "They tend to be a little juicy."

"Not a bit," he said, looking past her out the window at the snowman in the backyard. The snow he and Aunt Lulla had packed around it and on

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top of it was melting. He'd have to sneak out during dinner and pile more snow on.

"Here," his mom said, handing him the mashed potatoes. "Heat these up in the microwave while I make the gravy."

"It's made," he said, lifting the lid off the saucepan to show her the gently bubbling gravy. It had taken them four tries, but as Aunt Lulla had pointed out, they had more than enough drippings to experiment with, and, as she had also pointed out, three lardballs made a more realistic snowman.

"The top one's too big," Luke had said, scooping up snow to cover it with.

"I may have gotten a little carried away with the flour," Aunt Lulla had admitted. "On the other hand, it looks exactly like Orson." She stuck two olives in for eyes. "And so appropriate. He always was a fathead."

"The gravy smells delicious," Luke's mother said, looking surprised. "*You* didn't make it, did you?"

"No. Aunt Lulla."

"Well, I think you're a saint for putting up with her and her wild tales all afternoon," she said, ladling the gravy into a bowl and handing it to Luke.

"You mean she made all that stuff up?" Luke said.

"Do you have a gravy boat?" his mother asked, opening cupboards.

"No," he said. "Aunt Lulla wasn't really an actress?"

"*No*." She took a bowl out of the cupboard. "Do you have a ladle?"

"No."

She got a dipper out of the silverware drawer. "Lulla was never in a single play," she said, ladling the gravy into a bowl and handing it to Luke, "where she hadn't gotten the part by sleeping with somebody. Lionel Barrymore, Errol Flynn, Kenneth Branagh . . ." She opened the oven to look at the goose. ". . . and that's not even counting Alfred."

"Alfred *Lunt*?" Luke asked.

"Hitchcock. I think this is just about done."

"But I thought you said she was the shy one."

"She was. That's why she went out for drama in high school, to overcome her shyness. Do you have a platter?"

At 6:35 P.M., a member of the Breckenridge ski patrol, out looking for four missing cross-country skiers, spotted a taillight (the only part of Kent and Bodine's Honda not covered by snow). He had a collapsible shovel with him, and a GPS, a satellite phone, a walkie-talkie, Mylar blankets, insta-heat packs, energy bars, a thermos of hot cocoa, and a stern lecture on winter safety, which he delivered after he had dug Kent and Bodine out and which they really resented. "Who did that fascist geek think he was, shaking his finger at us like that?" Bodine asked Kent after several tequila slammers at the Laughing Moose.

"Yeah," Kent said eloquently, and they settled down to the serious business of how to take advantage of the fresh powder that had fallen while they were in their car.

"You know what'd be totally extreme?" Bodine said. "Snowboarding at night!"

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* * *

Shara was quite a girl. Warren didn't have a chance to call Marjean again until after seven. When Shara went in the bathroom, he took the opportunity to dial home. "Where *are* you?" Marjean said, practically crying. "I've been worried sick! Are you all right?"

"I'm still in Cincinnati at the airport," he said, "and it looks like I'll be here all night. They just closed the airport."

"Closed the airport. . . ." she echoed.

"I *know,*" he said, his voice full of regret. "I'd really counted on being home with you for Christmas Eve, but what can you do? It's snowing like crazy here. No flights out till tomorrow afternoon at the earliest. I'm in line at the airline counter right now, rebooking, and then I'm going to try to find a place to stay, but I don't know if I'll have much luck." He paused to give her a chance to commiserate. "They're supposed to put us up for the night, but I wouldn't be surprised if I end up sleeping on the floor."

"At the airport," she said, "in Cincinnati."

"Yeah." He laughed. "Great place to spend Christmas Eve, huh?" He paused to give her a chance to commiserate, but all she said was, "You didn't make it home last year either."

"Honey, you know I'd get there if I could," he said. "I tried to rent a car and drive home, but the snow's so bad they're not even sure they can get a shuttle out here to take us to a hotel. I don't know how much snow they've had here—"

"Forty-six inches," she said.

Good, he thought. From her voice he'd been worried it might not be snowing in Cincinnati after all. "And it's still coming down hard. Oh, they just called my name. I'd better go."

"You do that," she said.

"All right. I love you, honey," he said, "I'll be home as soon as I can," and hung up the phone.

"You're married," Shara said, standing in the door of the bathroom. "You sonofabitch."

Paula didn't say yes to Jim's proposal after all. She'd intended to, but before she could, the viola player had cut in. "Hey, wait a minute!" he'd said. "I saw her first!"

"You did not," Jim said.

"Well, no, not technically," he admitted, "but when I did see her, I had the good sense to flirt with her, not get engaged to Vampira like you did."

"It wasn't Jim's fault," Paula said. "Stacey always gets what she wants."

"Not this time," he said. "And not me."

"Only because she doesn't want you," Paula said. "If she did—"

"Wanna bet? You underestimate us musicians. And yourself. At least give me a chance to make my pitch before you commit to this guy. You can't get married tonight anyway."

"Why not?" Jim asked.

"Because you need two witnesses, and I have no intention of helping *you,*" he pointed at Jim, "get the woman *I* want. I doubt if Stacey's in the mood to be a witness either," he said as Stacey stormed back in the sanc-

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tuary, with the minister in pursuit. Stacey had on her wedding dress, a parka, and boots.

"You can't go out in this," the minister was saying. "It's too dangerous!"

"I have no intention of staying here with him," Stacey said, shooting Jim a venomous glance. "I want to go home *now*." She flung the door open on the thickly falling snow. "And I want it to stop *snowing!*"

At that exact moment, a snowplow's flashing yellow lights appeared through the snow, and Stacey ran out. Paula and Jim went over to the door and watched Stacey wave it down and get in. The plow continued on its way.

"Oh, good, now we'll be able to get out," the minister said and went to get her car keys.

"You didn't answer my question, Paula," Jim said, standing very close.

The plow turned and came back. As it passed, it plowed a huge mass of snow across the end of the driveway.

"I mean it," Jim murmured. "How about it?"

"Look what I found," the viola player said, appearing at Paula's elbow. He handed her a piece of wedding cake.

"You can't eat that. It's—" Jim said.

"—not bad," the viola player said. "I prefer chocolate, though. What kind of cake shall we have at our wedding, Paula?"

"Oh, look," the minister said, coming back in with her car keys and looking out the window. "It's stopped snowing."

"It's stopped snowing," Chin said.

"It has?" Nathan looked up from his keyboard. "Here?"

"No. In Oceanside, Oregon. And in Springfield, Illinois."

Nathan found them on the map. Two thousand miles apart. He checked their barometer readings, temperatures, snowfall amounts. No similarity. Springfield had thirty-two inches, Oceanside an inch and a half. And in every single town around them, it was still snowing hard. In Tillamook, six miles away, it was coming down at the rate of five inches an hour.

But ten minutes later, Chin reported the snow stopping in Gillette, Wyoming; Roulette, Massachusetts; and Saginaw, Michigan, and within half an hour the number of stations reporting in was over thirty, though they seemed just as randomly scattered all over the map as the storm's beginning had been.

"Maybe it has to do with their names," Chin said.

"Their names?" Nathan said.

"Yeah. Look at this. It's stopped in Joker, West Virginia, Bluff, Utah, and Blackjack, Georgia."

At 7:22 P.M., the snow began to taper off in Wendover, Utah. Neither the Lucky Lady Casino nor the Big Nugget had any windows, so the event went unnoticed until Barbara Gomez, playing the quarter slots, ran out of money at 9:05 P.M. and had to go out to her car to get the emergency twenty she kept taped under the dashboard. By this time, the snow had nearly stopped. Barbara told the change girl, who said, "Oh, good. I was worried about driving to Battle Mountain tomorrow. Are the plows out?"

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Barbara said she didn't know and asked for ten rolls of nickels, which she promptly lost playing video poker.

By 7:30 P.M. CNBC had replaced its logo with *Digging Out,* and ABC had retreated to Bing and *White Christmas,* though CNN still had side-by-side experts discussing the possibility of a new ice age, and on Fox News, Geraldo Rivera was intoning, "In his classic poem, 'Fire and Ice,' Robert Frost speculated that the world might end in ice. Today we are seeing the coming true of that dire prediction—"

The rest had obviously gotten the word, though, and CBS and the WB had both gone back to their regular programming. The movie "White Christmas" was on AMC.

"Whatever this was, it's stopping," Nathan said, watching "I-80 now open from Lincoln to Ogalallah," scroll across the bottom of NBC's screen.

"Well, whatever you do, don't tell those corporate guys," Chin said, and, as if on cue, one of the businessmen Nathan had met with that morning called.

"I just wanted you to know we've voted to approve your grant," he said.

"Really? Thank you," Nathan said, trying to ignore Chin, who was mouthing, "Are they giving us the money?"

"Yes," he mouthed back.

Chin scribbled down something and shoved it in front of Nathan. "Get it in writing," it said.

"We all agreed this discontinuity thing is worth studying," the businessman said, then, shakily, "They've been talking on TV about the end of the world. You don't think this discontinuity thing is that bad, do you?"

"No," Nathan said, "in fact—"

"Ix-nay, ix-nay," Chin mouthed, wildly crossing his arms.

Nathan glared at him. "—we're not even sure yet if it is a discontinuity. It doesn't—"

"Well, we're not taking any chances," the businessman said. "What's your fax number? I want to send you that confirmation before the power goes out over here. We want you to get started working on this thing as soon as you can."

Nathan gave him the number. "There's really no need—" he said.

Chin jabbed his finger violently at the logo *False Alarm* on the screen of Adler's TV.

"Consider it a Christmas present," the businessman said, and the fax machine began to whir. "There *is* going to be a Christmas, isn't there?"

Chin yanked the fax out of the machine with a whoop.

"Definitely," Nathan said. "Merry Christmas," but the businessman had already hung up.

Chin was still looking at the fax. "How much did you ask them for?"

"Fifty thousand," Nathan said.

Chin slapped the grant approval down in front of him. "And a merry Christmas to you, too," he said.

At seven-thirty, after watching infomercials for NordicTrack, a combination egg poacher and waffle iron, and the revolutionary new DuckBed,

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Bev put on her thin coat and her still-damp gloves and went downstairs. There had to be a restaurant open somewhere in Santa Fe. She would find one and have a margarita and a beef chimichanga, sitting in a room decorated with sombreros or piñatas, with striped curtains pulled across the windows to shut the snow out.

And if they were all closed, she would come back and order from room service. Or starve. But she was *not* going to ask at the desk and have them phone ahead and tell her the El Charito had closed early because of the weather, she was not going to let them cut off all avenues of escape, like Carmelita. She walked determinedly past the registration desk toward the double doors.

"Mrs. Carey!" the clerk called to her, and when she kept walking, he hurried around the desk and across the lobby to her. "I have a message for you from Carmelita. She wanted me to tell you midnight mass at the cathedral has been cancelled," he said. "The bishop was worried about people driving home on the icy roads. But Carmelita said to tell you they're having mass at eight o'clock, if you'd like to come to that. The cathedral's right up the street at the end of the plaza. If you go out the north door," he pointed, "it's only two blocks. It's a very pretty service, with the luminarias and all."

And it's somewhere to go, Bev thought, letting him lead her to the north door. It's something to do. "Tell Carmelita thank you for me," she said at the door. "And *Feliz Navidad*."

"Merry Christmas." He opened the door. "You go down this street, turn left, and it's right there," he said and ducked back inside, out of the snow.

It was inches deep on the sidewalk as she hurried along the narrow street, head down, and snowing hard. By morning it would look just like back home. It's not fair, she thought. She turned the corner and looked up at the sound of an organ.

The cathedral stood at the head of the Plaza, its windows glowing like flames, and she had been wrong about the luminarias being ruined—they stood in rows leading up the walk, up the steps to the wide doors, lining the adobe walls and the roofs and the towers, burning steadily in the descending snow.

It fell silently, in great, spangled flakes, glittering in the light of the street lamps, covering the wooden-posted porches, the pots of cactus, the pink adobe buildings. The sky above the cathedral was pink, too, and the whole scene had an unreal quality, like a movie set.

"Oh, Howard," Bev said, as if she had just opened a present, and then flinched away from the thought of him, waiting for the thrust of the knife, but it didn't come. She felt only regret that he couldn't be here to see this and amusement that the sequined snowflakes sifting down on her hair, on her coat sleeve, looked just like the fake snow at the end of *White Christmas*. And, arching over it all, like the pink sky, she felt affection—for the snow, for the moment, for Howard.

"You did this," she said, and started to cry.

The tears didn't trickle down her cheeks, they poured out, drenching her face, her coat, melting the snowflakes instantly where they fell. Healing tears, she thought, and realized suddenly that when she had asked

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Howard how the movie ended, he hadn't said, "They lived happily ever after." He had said, "They got a white Christmas."

"Oh, Howard."

The bells for the service began to ring. I need to stop crying and go in, she thought, fumbling for a tissue, but she couldn't. The tears kept coming, as if someone had opened a spigot.

A black-shawled woman carrying a prayer book put her hand on Bev's shoulder and said, "Are you all right, *señora?*"

"Yes," Bev said, "I'll be fine," and something in her voice must have reassured the woman because she patted Bev's arm and went on into the cathedral.

The bells stopped ringing and the organ began again, but Bev continued to stand there until long after the mass had started, looking up at the falling snow.

"I don't know how you did this, Howard," she said, "but I know you're responsible."

At eight P.M., after anxiously checking the news to make sure the roads were still closed, Pilar put Miguel to bed. "Now go to sleep," she said, kissing him good-night. "Santa's coming soon."

"Hunh-unh," he said, looking like he was going to cry. "It's snowing too hard."

He's worried about the roads being closed, she thought. "Santa doesn't need roads," she said. "Remember, he has a magic sleigh that flies through the air even if it's snowing."

"Hunh-*unh,*" he said, getting out of bed to get his Rudolph book. He showed her the illustration of the whirling blizzard and Santa shaking his head, and then stood up on his bed, pulled back the curtain, and pointed through the window. She had to admit it did look just like the picture.

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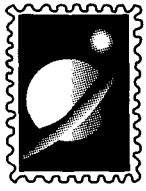

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"But he had Rudolph to show the way," she said. "See?" and turned the page, but Miguel continued to look skeptical until she had read the book all the way through twice.

At 10:15 P.M. Warren Nesvick went down the hotel's bar. He had tried to explain to Shara that Marjean was his five-year-old niece, but she had gotten completely unreasonable. "So I'm a cancelled flight out of Cincinnati, am I?" she'd shouted. "Well, I'm canceling you, you bastard!" and slammed out, leaving him high and dry. On Christmas Eve, for Christ's sake.

He'd spent the next hour and a half on the phone. He'd called some women he knew from previous trips but none of them had answered. He'd then tried to call Marjean to tell her the snow was letting up and United thought they could get him on standby early tomorrow morning and to try to patch things up—she'd seemed kind of upset—but she hadn't answered either. She'd probably gone to bed.

He'd hung up and gone down to the bar. There wasn't a soul in the place except the bartender. "How come the place is so dead?" Warren asked him.

"Where the hell have you been?" the bartender said and turned on the TV above the bar.

". . . most widespread snowstorm in recorded history," Dan Abrams was saying. "Although there are signs of the snow beginning to let up here in Baltimore, in other parts of the country they weren't so lucky. We take you now to Cincinnati, where emergency crews are still digging victims out of the rubble." It cut to a reporter standing in front of a sign that read *Cincinnati International Airport*. "A record forty-six inches of snow caused the roof of the main terminal to collapse this afternoon. Over two hundred passengers were injured, and forty are still missing."

The goose was a huge hit, crispy and tender and done to a turn, and everyone raved about the gravy. "Luke made it," Aunt Lulla said, but Madge and his mom were talking about people not knowing how to drive in snow and didn't hear her.

It stopped snowing midway through dessert, and Luke began to worry about the snowman but didn't have a chance to duck out and check on it till nearly eleven, when everyone was putting on their coats.

It had melted (sort of), leaving a round greasy smear in the snow. "Getting rid of the evidence?" Aunt Lulla asked, coming up behind him in her old-lady coat, scarf, gloves, and plastic boots. She poked at the smear with the toe of her boot. "I hope it doesn't kill the grass."

"I hope it doesn't affect the environment," Luke said.

Luke's mother appeared in the back door. "What are you two doing out there in the dark?" she called to them. "Come in. We're trying to decide who's going to have the dinner next Christmas. Madge and Shorty think it's Uncle Don's turn, but—"

"I'll have it," Luke said and winked at Lulla.

"Oh," his mother said, surprised, and went back inside to tell Madge and Shorty and the others.

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"But not goose," Luke said to Lulla. "Something easy. And nonfat."

"Michael had a wonderful recipe for duck a l'orange Alsacienne, as I remember," Lulla mused.

"Michael Caine?"

"No, of course not, Michael Redgrave. Michael Caine's a terrible cook," she said. "Or—I've got an idea. How about Japanese blowfish?"

By 11:15 P.M. Eastern Standard Time, the snow had stopped in New England, the Middle East, the Texas panhandle, most of Canada, and Nooseneck, Rhode Island.

"The storm of the century definitely seems to be winding down," Wolf Blitzer was saying in front of CNN's new logo: *The Sun'll Come Out Tomorrow,* "leaving in its wake a white Christmas for nearly everyone—"

"Hey," Chin said, handing Nathan the latest batch of temp readings. "I just thought of what it was."

"What what was?"

"The factor. You said there were thousands of factors contributing to global warming, and that any one of them, even something really small, could have been what caused this."

He hadn't really said that, but never mind. "And you've figured out what this critical factor is?"

"Yeah," Chin said. "A white Christmas."

"A white Christmas," Nathan repeated.

"Yeah! You know how everybody wants it to snow for Christmas, little kids especially, but lots of adults, too. They have this Currier-and-Ives thing of what Christmas should look like, and the songs reinforce it: 'White Christmas' and 'Winter Wonderland' and that one that goes, 'The weather outside is frightful,' I never can remember the name—"

"'Let It Snow,'" Nathan said.

"Exactly," Chin said. "Well, suppose all those people and all those little kids wished for a white Christmas at the same time—"

"They *wished* this snowstorm into being?" Nathan said.

"*No*. They *thought* about it, and their—I don't know, their brain chemicals or synapses or something—created some kind of electrochemical field or something, and that's the factor."

"That everybody was dreaming of a white Christmas."

"Yeah. It's a possibility, right?"

"Maybe," Nathan said. Maybe there was some critical factor that had caused this. Not wishing for a white Christmas, of course, but something seemingly unconnected to weather patterns, like tiny variations in the earth's orbit. Or the migratory patterns of geese.

Or an assortment of factors working in combination. And maybe the storm was an isolated incident, an aberration caused by a confluence of these unidentified factors, and would never happen again.

Or maybe his discontinuity theory was wrong. A discontinuity was by definition an abrupt, unexpected event. But that didn't mean there might not be advance indicators, like the warning flickers of electric lights before the power goes off for good. In which case—

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"What are you doing?" Chin said, coming in from scraping his windshield. "Aren't you going home?"

"Not yet. I want to run a couple more extrapolation sets. It's still snowing in L.A."

Chin looked immediately alarmed. "You don't think it's going to start snowing everywhere again, do you?"

"No," Nathan said. Not yet.

At 11:43 P.M., after singing several karaoke numbers at the Laughing Moose, including "White Christmas," and telling the bartender they were going on "a moonlight ride down this totally killer chute," Kent Slakken and Bodine Cromps set out with their snowboards for an off-limits, high-avalanche-danger area near Vail and were never heard from again.

At 11:52 P.M., Miguel jumped on his sound-asleep mother, shouting, "It's Christmas! It's Christmas!"

It can't be morning yet, Pilar thought groggily, fumbling to look at the clock. "Miguel, honey, it's still nighttime. If you're not in bed when Santa comes, he won't leave you any presents," she said, hustling him back to bed. She tucked him in. "Now go to sleep. Santa and Rudolph will be here soon."

"Hunh-unh," he said and stood up on his bed. He pulled the curtain back. "He doesn't need Rudolph. The snow stopped, just like I wanted, and now Santa can come all by himself." He pointed out the window. Only a few isolated flakes were still sifting down.

Oh, no, Pilar thought. After she was sure he was asleep, she crept out to the living room and turned on the TV very low, hoping against hope.

"—roads will remain closed until noon tomorrow," an exhausted-looking reporter said, "to allow time for the snow plows to clear them: State Highway 56, I-15 from Chula Vista to Murrietta Hot Springs, Highway 78 from Vista to Escondido—"

Thank you, she murmured silently. Thank you.

At 11:59 P.M. Pacific Standard Time, Sam "Hoot'n'Holler" Farley's voice gave out completely. The only person who'd been able to make it to the station, he'd been broadcasting continuously on KTTS, "Seattle's talk 24/7" since 5:36 A.M. when he'd come in to do the morning show, even though he had a bad cold. He'd gotten steadily hoarser all day, and during the nine P.M. newsbreak, he'd had a bad coughing fit.

"The National Weather Service reports that that big snowstorm's finally letting up," he croaked, "and we'll have nice weather tomorrow. Oh, this just in from NORAD, for all you kids who're up way too late. Santa's sleigh's just been sighted on radar over Vancouver and is headed this way."

He then attempted to say, "In local news, the snow—" but nothing came out.

He tried again. Nothing.

After the third try, he gave up, whispered, "That's all, folks," into the mike, and put on a tape of Louis Armstrong singing "White Christmas." ○

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THE MAN WHO LIVES IN THE ATTIC

Her best winter coat and gloves.
A rare figurine, Henry Moore copy,
limited edition, Zurich, 1943.

A bottle of sedatives. Her CD
of Joachim Zane. All of this
and more missing in the last week.

She finds the bread left on the
counter, open and stale. Empty
jars and cans in the garbage.

The fridge has been rearranged
and the milk keeps disappearing
though no glasses are dirty.

She imagines him standing in
the dark kitchen. Drinking from
the carton. One arm resting on

the open refrigerator door while
the light from within spills
across his jeans and bare feet.

She sees him roaming the house
in her absence, reading her
letters, touching her clothes.

She suspects that sooner or
later she will have to do
something about him. But the

days have been short this year,
her dreams rich and satisfying,
and he may not be real after all.

—Bruce Boston

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WAY OUT ON THE REGOLITH

John Alfred Taylor

The author, a retired professor of English, lives in Washington, Pennsylvania. His latest story continues the recollections of Helen, a charming character first introduced to us in "The Men on the Moon," a tale that we published in May 2001.

Helen and her great-granddaughter were shopping Northwest Plaza when they met the limping man.

Helen was in her hexaped walker that could climb stairs and ramps and run a hundred meters in thirty seconds, except there wasn't a straight hundred meters below Surface other than in the Archimedes High School Gym, with no chance anyone would let Helen in there unescorted. Once she'd been able to run that fast on her own, but now she wore a walker and enjoyed it.

They'd bought lettuce and beans and white asparagus ("Grown under pressure for your dining pleasure") at the farmers' co-op, chicken and soy curd, candy at Singh's Jolly Jellaby, a spitfire bracelet for Fran now that spitfire jewelry was fashionable again (Helen had muttered a bit of doggerel about "Retro is as retro does. Fads that is is fads that was") and now they were quartering back across the Plaza between market booths and boxes of plantings.

Shopping bags hung round Helen's walker like trophy heads, and Fran was lugging a bag that stretched halfway to the floor-grid when they met him. The limping man was short, wide, and brown, with a face like beaten copper. He smiled at Helen and bent his head, and she smiled and bowed in return before he was lost in the crowd.

"Who was that, Gee-Gee?"

"A man I slept with once."

"A customer?"

Helen laughed so loud that she frightened a lady coming toward her. Fran's imagination was fixed on her disreputable past. "No. Not that kind of *slept with*. We were in the same cheap and skinny bed, but we actually *slept*. Both too tired to do anything else."

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"But why does he limp?" Fran said. "Nobody has to limp."

"Cause he chose to, honey. Same way I decided not to have my hip repaired again."

"I don't understand."

"It's a long story, too long to tell you standing up." Helen pointed toward their favorite coffeehouse.

Fran had a cappuccino, and Helen sipped her kava-kava and looked around the comfortable darkness for a moment before starting.

"Guess I better tell my part of the story before I tell Juan's. I was still young and foolish—"

Fran gave her a hurt look. "You always say 'young and foolish' like the two go together, Gee-Gee."

"Do I now? Don't take it personally, dear. I'm living proof they don't go together, because I'm still foolish sometimes, even though I'm old, though not like then. Anyway I was out in a six-wheeler scouting out the land. Lunar Power was going to bring a superconducting line round the end of the Haemus Mountains down into the Mare Tranquillitatis. A survey team would come through later and lay out the route in detail. I was just out on the ground to spot any obvious problems ahead of time."

She shook her head in wonder at her younger self. "Anyway, I'd filed the usual travel plan before I started, just to the Acherusa Promontory and back. But when I got past, I still had plenty of H and LOX in my tanks, so why not go south and check out a little more?

"I went east all round Pliny, and was whizzing along down the Sea of Tranquillity—or maybe I should call it the Sea of Complacency, considering what happened next—

"The wheels stopped turning so fast the nose went way down before the shocks leveled her. Would've bounced off the roof if I wasn't strapped down. The cabin lights went out, the emergency lights came on, and the telltale on the dash was really bad news.

"The proton exchange membrane of the fuel cell was dead. A moment later, the crappy battery backup failed and everything went off. Which meant that I was dead too, because nobody knew where I was. There was no line-of-sight communication down Tranquillity yet, and I didn't have power left to send a mayday to the satellite system.

"But never say die, even if you're dead. The closest help on Tranquillity was the helium mines about 120 klicks to the southeast. I shrugged into my life-support pack, hooked it up, and closed my faceplate. If I carried the spare bottle, I maybe had enough air to get me a quarter of the way before falling on my face. They wouldn't find the remains till long after the sun was up, and I tried to figure out whether I'd be mummified or parboiled.

"Then I remembered that I had a whole tankful of LOX behind me. If I could use *that*—

"It took some doing. In the end, I had the side panel off with the LOX tank and the spare bottle strapped on it, with a carbon fiber rope through holes I'd drilled in the front. It would have been pointless, except that I'd found an adapter that would let me transfer the LOX a little at a time when I needed it.

"I made sure the water bladder in my suit was full, leaned forward

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against the sled harness, and started out. Things wouldn't smell very nice in the suit after awhile, what with sweat and piss, but at least I was wearing a nice thick diaper.

"It would be a long walk, but I might make it. Better than staying there and dying on my butt."

Fran's eyes were wide. "Weren't you scared, Gee-Gee?"

"Course I was scared. I might have been young and foolish, but I sure wasn't dumb enough to be brave."

"Juan had it lots worse than I did," Helen continued. "He'd been doing the same kind of job as I had, but prospecting instead of scouting, and traveling much more slowly.

"He pedaled a recumbent trike, with a tiny fuel cell and motor combo for backup when he needed to climb slopes, and towed a trailer with an inflatable tent on it. Every hundred meters, he'd stop, set up a tripod with a pulley and send an ultrasonic drill down three meters to assay for helium and titanium content, then put the drill in reverse and pull it up on the cable, move a hundred meters on and do it again. Lonely as herding sheep back in Bolivia—no, lonelier he said, because at least sheep were company.

"He'd open the tripod, push down a pedal on the nearest leg to anchor all three, and drop the drill. After it went down and transmitted the readout to the trike's memory, he'd pull up, push the pedal twice to loose the anchors, and move on. Some people might be bored as all get out, but Juan didn't mind. He had to be way out on the regolith, far ahead of the mining rigs, so they knew which way to come.

"Until this time, all routine, and Juan was good at it. Like always, he flipped open the tripod, pushed the pedal to drive in the anchors, lowered the drill on the cable till its nose touched, and sent her down. He'd done it thousands of times. But this time the drill came back up very fast because he'd hit a gas pocket that might have been there for half a million years. The tripod went zinging off over his head, but the pedal ripped open the toe of his boot on the way up.

"If he'd been wearing a pressure suit like mine, he would have decompressed and been dead in minutes, but a prospector's suit was something else; an automatic tourniquet clamped around just below the knee, which meant he'd last long enough to die slower. It would be a race between gangrene and his foot freezing, unless he lost too much oxygen or water through the dying tissue first.

"Maybe he could pedal. Juan got back in the seat and tried. At first it hurt too much, and then his leg turned numb to the point where he couldn't make it do much of anything. And he didn't have enough juice to get back—the fuel cell was just an auxiliary. Then I came down the pike—"

"The pike, Gee-Gee?"

"A dead idiom, Fran—not worth the explaining. By the time I arrived, Juan was having serious thoughts about hurrying the inevitable—he had enough neomorphine in his medkit to make it quick and painless.

"He was sitting down, leaning against a wheel as I came round a dinky crater. He stared at me, I stared at him, and when we were closer we babbled till we understood each other's situation."

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"But he had a long-range radio, didn't he?"

Helen smiled sardonically. "Not a working one. Guess where the dish was mounted?"

"It wasn't on the trailer?"

"Nope. On top of the tripod. Designers tried the old Swiss Army knife approach to lighten ship—usually makes sense, but not this one weird time. So we were both up the creek."

"What's 'up the creek' mean, Gee-Gee?"

"Another hard-to-explain idiom, honey. Especially since you've never seen a creek. But when we finally understood each other's situations, Juan and I looked at each other and smiled. Almost simultaneously, we'd realized we might live. Just might.

"I wanted to take care of his foot right away, but Juan had a better sense of priorities. Time for that later. We left the sledge and LOX tank there, and started back on my trail, with him in the trike and me sitting on the front of the trailer. I'd only come four klicks, and there was juice enough for that without any need to pedal.

"Back at my six-wheeler, we cannibalized the hydrogen tank and grabbed anything else we might need. I did the lifting and Juan did the thinking, not because he was smarter but because he had more experience improvising.

"So we got back with the tank of hydrogen, and figured out how to jury-rig it and the LOX tank to the trike's fuel-cell feed. It looked absurd, and would have given the guys who made the trike fits—except if they were the same people who put the dish on top of the tripod they maybe deserved it.

"We cut the bent tripod struts up for framing, and used carbon filament and wire to tie things together, and ended up with the two tanks standing on end against each other over the trike's rear wheels. The assemblage looked obscene, like a prick and balls turned upside down—"

Helen saw the look on Fran's face. "Hey, don't blame me! Juan was the one who made the comparison. Next comes the really obscene part.

"The trailer didn't have a real airlock; part of the floor came down as a ramp, you crawled up that—the tent had one bowed strut in the middle, so you had just enough room underneath before it was inflated. Then you pulled up the door and dogged it, and put the scavenger pump in reverse. We opened our faceplates, and our breath steamed for a moment in the chilly air.

"The trailer was Spartan, of course, but sort of cozy. I wanted to start right away, but Juan said wait till our body heat warmed the place up. Then we got our suits off. His foot and ankle looked horrible, red where it wasn't purple and speckled with frost.

"We laid out everything we'd need; his work knife, a can of bandage spray and old-fashioned plastic net bandages from the medkit, one of those roll-up saws with two handles and a toothed wire between. Juan filled five microneedle hypos full of neomorphine and drew a circle on his leg with a grease pencil fifteen centimeters below his knee. I wondered if that wasn't a little high, since the cicatrix from the tourniquet was lower, but he said better safe than sorry.

"Then Juan saw the look on my face and asked if I was okay. I told him maybe not, but I was better off than he was, and able to do the necessary.

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He nodded and squeezed my hand and gave himself a shot of neomorphine in the lower thigh. We waited a few minutes for it to hit before I started.

"He had an unopened bottle of vodka in the tent—just in case, though Juan never drank when he was out alone. Now we'd opened it to soak the knife and saw, and I used more to sterilize the area.

"Then I started cutting, glad he'd drawn the line so I didn't have to go by guess. There was less bleeding than I'd expected, maybe because of clotting or freezing. But it took awhile, and Juan used another two hypos.

"I'd seen plenty of anatomical charts and animations over the years, but never actually realized how complicated the intertwining of the muscles and tendons and blood vessels was till I chopped through them. It was saw-time next, and that went a lot faster, with fullerine nanotubes and diamond teeth slicing through the two bones. By then I was calm as Juan was, just doing what I had to. Maybe there was a little sweat on our foreheads, but nothing extreme.

"I spray-bandaged the stump, then wrapped it in all the net bandage there was, and had a vodka and water afterward. Warm vodka is awful, even diluted, but I needed it.

"We ate some ration bars, Juan laid out the other microneedles in case he needed more painkiller during the night, and we went to bed in our long johns, with me hugging Juan from behind on his narrow little mattress. Nothing to do with sex, just huddling together for warmth and consolation in the middle of the big empty. I remember thinking how friendly the light of our little glowlamp was as I went to sleep.

"Breakfast was more ration bars. Even with the tanks from my scout car, Juan didn't want to use any power from the fuel cell for cooking. Last night we'd talked inconclusively about how to fix the leak in his spaceboot, but the solution hadn't come to him till he woke up. 'First we use my foot,' he said, and when he explained, I almost couldn't finish my ration bar. "Put it back in the boot, and as soon as we're in vacuum, the tourniquet will clamp down again.'

"'But that won't be enough,' I said.

"'Right,' he said. 'But it'll be a start.'

"What helped was that there was a tent-repair kit. First, we stuffed rags smeared with sealant inside the toe of the boot, then pushed in what I'd amputated a few hours ago—not easy with the foot and calf so stiff—and folded a patch over the slash in the boot, put a lot more sealant on, wrapped the patched toe round and round with lots of tape, the kind that cures in vacuum. Just to make things sure, we stuffed more rags and sealant on top of the stubs of bone and muscle before he locked the boot back on.

"Outside, Juan slung his arm over my shoulder and we struggled forward so he could show me how to turn on the trike engine and point out the landmarks. I helped him back, lifted him up onto the front of the trailer, and turned the trike southeast.

"So you'd think we were home free, with enough LOX and H to take us halfway to Hell or Mare Nubium, whichever was closest. But the sun would be coming up before us in less than eight hours, and the motor could only

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drive the trike at ten klicks an hour, which meant that things could get mighty hot long before we reached the nearest mining station.

"'You could pedal too,' Juan said. 'The transmission is sophisticated—adds your muscle power to the output of the electric motor.' So I tried, and our speed crept up to 16 KPH.

"Great, except that then I found out another way Juan's prospector's suit was different from mine. His was built to cycle in, with extra gussets in the groin, and wider in the upper leg, but when I pedaled, my inner thighs rubbed against the suit, with my underwear not much protection.

"There wasn't anything else to do except keep on straining and steer the trike the smoothest way, turning on the ration bar feeder when I was hungry, turning my head the other way inside my helmet and sucking on the nipple when I was thirsty. When your great-grandfather was educating me years later, I learned a little poem that really fit the way I felt then. By a guy named Tennyson:

Is there any peace
In ever climbing up the climbing wave?
All things have rest, and ripen toward the grave . . .

"That's the lotos-eaters in the poem talking."

"Lotos-eaters?"

"It's an old story—the lotos was a fruit that was a drug. They were still a long way from home."

I don't like that 'ripen toward the grave' part." Fran said.

"Neither did I, though the way I felt then it was hard to resist."

"Where does the lotos grow?"

"It's just a story, child. Don't slow me down for explanations, child. Anyway, here I was pedaling for dear life, with my sexy thighs getting rubbed raw, and my only break when it was time to shift suit tanks—I'd stagger off the trike, go back to the trailer for our fresh ones, do the exchange for Juan and me, take the empties back to the trailer, then back on my seat of pain again.

"All the time I kept thinking about how I might be saving my life, but—pardon the pun—losing my assets. In my second business, smooth thighs were important.

"We'd seen the strobe flasher on the isotope mine's communication tower above the horizon for hours and were only six klicks away when the sun came up. Our helmets polarized fast enough to keep us from going blind, but I had to stop the trike till the blue afterimage went away, then started pedaling hard as I could again.

"When I wasn't sucking lukewarm water from my helmet nipple, or re-

MOVING?

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viewing the symptoms of heatstroke and heat exhaustion, I was trying to persuade Juan to get back in the tent: the top had better reflectivity than our suits, plus radiative cooling fins on the bottom of the trailer. But he refused, and said we were in this together.

"I had plenty of air in my tank, so opened the exhaust valve wider; that might cool me down a little.

"Then we were almost there, except that those last few hundred meters were going to be impossible to cross. I'd been pedaling so hard I hadn't paid enough attention to where I was going, and stopped on the very brink of the drop. Three meters straight down where the mining machine had chewed up the regolith on its circular sweep. Now what?

"I cried then, I was so angry. To have come so far, and then be stopped by the mobile station's self-made moat!

"Then Juan shouted 'Look, look!' and I stopped crying. The mining machine had raised its digging wheel and was swinging back toward us fast—they'd seen us coming. It came up beside us, a hatch opened, four guys laid down a portable ramp across the gap, and we were saved. Two guys carried Juan, and the other two wanted to carry me, but I preferred to stagger on my own—with help, of course. The conveyer in the support arm had been stopped, and we walked in toward the station on shifting crushed regolith.

"Their paramedic tut-tutted a lot over Juan, a little over me, but at shift-change the guys going off celebrated our survival with a feast. Since most of the miners here were Bolivian, it wasn't exactly what I was used to. The drink was *chicha,* a kind of beer made with corn—not my favorite, but a hell of a lot better than warm vodka. But guess what the meat was—"

Fran closed her eyes for a moment, then grinned and guessed. "Rats, Gee-Gee?"

"Not quite that bad, honey. Guinea pigs."

"Yuck."

"My first reaction too. But that was all in my head. Guinea pig wasn't that bad, not much different from chicken or rabbit, especially after I drank more chicha.

"Not much more to tell," Helen continued, "unless you like more yuck. Juan's original foot and boot is still around."

"How else if it's buried on the Moon?"

"Except it's not. It's in a glass case in a dingy, dinky mining museum under Maskelyne—the main crater, not the smaller confusing ones with letters after the name—the closest place to a ghost town I know. Juan wanted his foot buried, but they talked him around. Only hope there isn't a photo of the blisters on my thighs next to it—the paramedic wanted to document my trauma too."

"Don't you know?"

"Nope. Never thought it was worth the trouble to find out. Especially since I was wearing a pair of men's underpants when he took the shot."

"But you still haven't told me why Juan limps, Gee-Gee. The thing I wanted to know first."

"That's easy, honey. Because when they regenerated his foot, the new leg was four centimeters longer than the other, and Juan got used to that, and didn't think it was worth trying the whole damn works again!" ❍

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WHEN THE ALIENS ASK OF BREAKFAST

Let me expound upon the eggs.
Let me fan the toast
like a hand of cards.
Let me bring the hash browns
with fingers still warm
from the broiler.
Let me show you
how to cradle the coffee
as if the wind
would blow it out.

Begin, it all says,
and just before you go,
take the heat and light
from the little kitchen fire,
a table of proof
that the planet turned
and we were brought forth
out of the night again
like bread triumphant
from the oven.

—Amy Miller

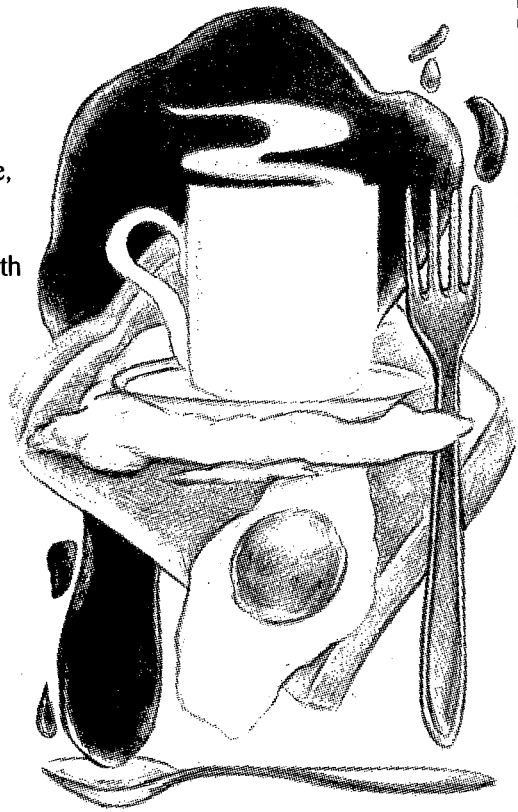

Illustration by June Levine

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MORTAL ENGINES

Michael Bateman

Michael Bateman spent the summer hiking, riding his mountain bike, and catching up on his reading. He is currently at work on several new short stories. "Mortal Engines" is his second tale to be published in *Asimov's.*

We found the alien spacecraft at the base of the Current Creek headwall, buried beneath five feet of avalanche debris. Less than a third of the featureless black saucer protruded above the boulder-sized chunks of ice and snow that lay in a vast, tongue-shaped jumble at the foot of the slope. At first, we didn't know what it was, only that it didn't look anything like the downed airplane we had been dispatched to find.

"What do you think?" I asked Lloyd.

We had stopped about fifty yards from the crash site, below a cluster of wind-stunted Douglas fir, the last protected vantage point before we had to traverse the bottom of the cirque. From there, we could see the craft's smooth, rounded edge and a ragged hole at the snowline leaking red-orange light.

Squinting against the falling snow, Lloyd lifted his gaze to the top of the cirque. Despite the avalanche the ship had brought down, a significant amount of snow still hung over us on the steep slope and in the curling, wave-shaped cornice at the top of the headwall. "It'll take an hour to get explosives out to the cornice and blast it," he said, his flat Texas drawl sounding particularly dull in the storm. After two tours of duty in Vietnam and twenty-five years on patrol, Lloyd wasn't afraid of much, and he never took an unnecessary risk. "They've been down at least that long already. Don't know if we have that kind of time. I say one of us goes, the other spots from here."

"I'll go," I said.

He looked hard at me, obviously considering the wisdom of sending a third-year patroller into a situation like this.

"Watch yourself."

With a glance at the headwall and the cornice, I pushed myself out of the sheltering trees and skied toward the crash site. About twenty yards from the ship, I encountered the edge of the avalanche's deposition zone, where the snow became lumpy and hard. I stepped out of my skis and

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walked the rest of the way, the crunch of hard snow and ice mixing with the squelch of new snow beneath my boots.

Warm, moist air billowed out of the ragged breach in the side of the ship, condensed as it met the sub-freezing air outside, and fell to the ground as snow. Bright metal, twisted and sharp-edged, bordered the hole. The smoldering light inside made the wreck look as if it was on fire. It reminded me of the night Sarah died.

We had had one of those early spring storms. Dumped four or five inches of wet snow on everything, turned the road into a skating rink. We were coming back from a counseling appointment in Denver. I took issue with something she'd said; I don't remember what it was, now. But I turned to her and said, "If that's how you feel, then maybe I should leave." And that's all the time it took. The logging truck loomed out of the storm like an apparition; the impact struck like thunder. Sarah died in the ambulance on the way to the hospital. Massive head injury, multiple rib fractures, a tension pneumothorax of the right lung, two fractured femurs, and a fractured pelvis. I had killed my wife.

I shook off the vision, pulled my goggles up, and stepped through the steaming gap into a sunlit world of pleated green hills, broad-winged birds, and kaleidoscope blossoms. The air was warm and smelled strongly of ammonia.

What was this?

I took a few tentative steps forward and realized the ground beneath my feet had changed; the Styrofoam squelch of snow had been replaced by the soft yield of earth. I looked down to see a tubular, grasslike plant, green and damp, folding under my ski boots. Somewhere in the distance, an alarm was wailing.

A cold gust of wind blew at my back. I turned around. The breach was a white slash across the purple summer sky, a lenticular drift of snow reaching out from it and covering the strange grass like the negative image of a shadow.

Light from a tiny white sun pounded the back of my neck, hot and intense. A large, four-winged creature soared low over my head. It was more like a bat than a bird, with translucent, leathery wings supported by fine finger bones. I stood there for some time, drinking it all in, before I noticed that the ground beneath my feet was level, not canted as it should have been in the steeply angled wreck. What was this place? Had I walked into some kind of simulation or was the landscape around me real?

With a start, I realized the alarm was still sounding. Slowly, reluctantly, I headed off in the direction of the noise.

A hundred feet or so from where I had entered the ship, the grass ended at a transparent wall. A tall, narrow door hung open on one end; on the other side, two people lay in a tangle of twisted metal and loose cables. I stumbled through the door and stopped to stare down at the crash victims. Not people. Creatures. Aliens.

My vision swam; my legs trembled. This can't be, I thought. Things like this don't happen. I felt a powerful need to run, to get as far away from the ship as I could; but then I remembered why I was there. This was just like any other emergency situation; I needed to focus on the things I

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knew how to do. Check for level of consciousness, airway, breathing, and circulation.

The aliens had bone-thin limbs and torsos and wedge-shaped heads, multifaceted like gemstones and punctuated by clusters of glittering beads that might have been eyes. Thousands of fine bumps covered their skin, which looked wet and bluish where it showed beneath the silklike green cloth they wore wrapped around themselves. My breath caught in my throat. They were beautiful.

One was obviously dead, crushed beneath a fallen beam; its red blood clung to the twisted metal, lay in pools on the shattered floor. Red, like ours, which I assumed meant they breathed oxygen. The other might have been alive or dead; I couldn't tell. There was nothing to indicate respiration, no sound or motion, no visible airway. I moved closer, careful on the slick metallic decking.

An alien. I didn't know anything about its anatomy and physiology. How was I going to be able to help it?

I removed a glove, leaned over the creature. It smelled strongly of salt and ammonia. I hesitated, afraid to touch it. I thought, if it bled, then it might have a heart. And if it did, then somewhere the circulating blood should come close to the skin and create a palpable pulse. The most likely place for this would be somewhere around the base of the head, or maybe the juncture of the limbs with the body. Putting aside my fear, I felt along the seam of the creature's neck and found a pulse, rapid and strong. Suddenly, my throat and lungs burned, as if I had breathed in hot smoke. I jerked my hand back, clutched at my throat; the pain subsided.

Footsteps sounded behind me.

"What do you have?" Lloyd asked, kneeling next to me.

I coughed, but my throat and lungs felt normal. What the hell had that been? "It's still alive," I said.

"Miles and Jan are outside. Dispatch is sending a sled."

I glanced at my watch. We had been here for forty minutes already; the sled would take at least another thirty to reach us. Too long. I looked down at the alien. It was one of the strangest, most beautiful creatures I had ever seen. I pulled out my trauma shears, cut open its clothing, and performed a detailed survey of its body. My hands started to shake as I felt over the creature's thorax and abdomen for any rigidity or deformity that might indicate an injury. *A dark ribbon of road winding between low, dirty snowbanks; headlights shining off icy pavement; the dark car crumpled under the truck's front end, its windows shattered, glassless.*

I remembered how helpless I had felt, lying in the snow, waiting for Sarah to die. I wasn't going to let that happen again. Turning toward Lloyd, I said, "We have to do something."

Lloyd never talked about the war, but people said he had seen things no person should ever have to see. He stared down at the alien creature, his face an inscrutable mask. "Airlife can't fly because of the storm. A ground ambulance will meet us on the highway."

I checked the alien's pulse again. *Sarah . . . wake up. Wake up.* I slammed my fist against the metal deck.

* * *

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Cajun and Ray arrived twenty minutes later with oxygen, a backboard, chemical heatpacks, a sled. We loaded the alien onto the backboard, strapped it down as best we could, placed the heatpacks around the core of its body, and covered it with blankets. Where to place the oxygen mask became a matter for discussion; the creature had no discernible mouth or nose. After I suggested it might breathe through its skin, we still couldn't decide exactly where we should secure the mask. Lloyd finally suggested we make a tent out of the blankets and insert the oxygen mask into it.

Once we had the creature secure in the sled, the evacuation was routine. Cajun took the handle bars, while Ray tailroped, keeping the sled stable on the steep slope, and Miles and Jan skied ahead to break trail through the new snow.

Back inside the ship, Lloyd and I regarded the body of the dead alien. By law, we weren't allowed to remove a dead body from an accident scene. We didn't know if that applied to alien bodies, but we decided to err on the side of caution and leave it up to the sheriff, or the federal government as Lloyd pointed out, to retrieve the dead creature. Anyone who wanted to have a look at it or the ship was going to have a hell of a time getting here in the storm, so we figured that, at least for now, it was safe to leave the body behind.

We caught up to the sled at the bottom of the Current Creek drainage, and we helped ease it over the snowbank onto the icy pavement. A Grand County ambulance was waiting for us amid a cloud of diesel fumes and strobing lights in a pullout just down from where we had emerged. *Emergency lights cutting through the storm, lancing off the frozen highway. Dull, empty ache, as if a hole had been carved out of my stomach, as if something should be there, at the center, but was gone, suddenly and forever.*

The rear door of the ambulance opened and a blue-uniformed paramedic climbed out. He slogged up the highway through ankle deep snow, head bowed to the wind. When he reached us, he grabbed hold of one of the sled's handle bars and helped us drag it. "The pass is closed. Stanley slid to the ground," he said, referring to one of the perennial avalanche paths on the east side of the pass. "We'll have to go to Timberline."

We transferred the alien to the back of the ambulance. I got in with the paramedic while Lloyd and the others climbed into a ski resort van that was waiting to take them back to town.

Once we were underway, the paramedic lifted the blanket to get a set of vital signs. "What. . . ?" he said, recoiling. "What is it?"

"It has a pulse," I said, replacing the blanket. "So we assumed it was breathing, but we couldn't detect any respirations."

He wrinkled his nose and grunted. "Smells." He retrieved a clipboard from a shelf next to the gurney, his hands visibly shaking.

"Can't it wait?" I said.

He looked at me.

"The report. Isn't there something you can give it, IV fluids or something? There's not much time."

"How can I give it drugs if I don't know anything about its physiology?"

I'm sorry, Mister Weber, but your wife died on the way to the hospital.

"We have to do something," I said.

"Look, the best thing we can do is transport it to the clinic where they

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can do tests, figure some things out. Why don't you tell me what you guys did up on the mountain."

We arrived at Timberline Medical Center a half hour later. The clinic normally closed for the day at six, but patrol dispatch had notified them of the wreck, and a doctor and nurse were waiting for us.

"What do you have?" the physician, Doctor Jostein Novacek, asked as we lowered the gurney to the ground.

"You're not going to believe it," the paramedic said, stepping down from the back of the ambulance.

"Unknown," I answered.

Novacek looked at me quizzically, then pulled back the blankets. His face remained impassive, the only indication of surprise a slight widening of his eyes, hardly even there, but significant nonetheless.

"Crash landed in Current Creek," I said.

He replaced the blanket. "I see. Let's get it into X-ray, see what we're dealing with."

We wheeled the gurney through the double glass doors into the clinic.

"Why don't you stay out here?" the nurse, Hannah, said to me as we approached X-ray. Her voice was gentle but firm, as if she understood how I was feeling, but was nevertheless going to insist on protocol. I pulled up short. She closed the door.

I spent the next ten minutes pacing the hallway, listening to muted voices through the thick door and the intermittent hum of the x-ray machine. *If the accident had happened in front of the hospital, she still wouldn't have made it.* I shook my head, forced myself to think about something else. My guess about the creature's circulatory system had been lucky. I could just as easily have been wrong. Its blood vessels could have pumped the blood through a kind of peristaltic motion; or it might not have had blood vessels, but some sort of porous membrane through which blood passed under osmotic pressure. It made me wonder what other assumptions we had made, and how many of them were wrong.

Lloyd came in a few minutes later accompanied by the van driver. She was slightly older than I was, maybe thirty, with spiky blond hair and a severe face. She glanced at me as she and Lloyd walked through the door but otherwise didn't acknowledge my presence.

"Press has been calling all afternoon," she said. "They still think it's a downed airplane. The feds, on the other hand, know what we have and don't want us to do anything until they arrive."

"Too late," Lloyd said. He gestured toward the door and the storm outside. "Anyway, it might be days before they get here."

The two of them stopped directly in front of me, but neither one paid me any attention. "What about the sheriff?" I asked.

The woman looked at me as if she had just noticed I was there. "They're going to be delayed. There was a fatal accident on Highway 40." She explained she was the resort's manager on call for the night and if we needed anything we should page her, then she went back out into the storm.

The door to X-ray opened; Novacek came out, slipped a pair of films into the viewer. "Look at that," he said.

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Lloyd and I approached the viewer. The films were labeled "AP," for anterior-posterior, and "lateral" and showed thin, dark lines braided like wire throughout the ghostly image of the alien's chest and abdomen. A fine net of single strands extended from these out to the thick layer of skin. None of the lines looked broken, but three black splotches interrupted the almost geometric integrity of the creature's anatomy.

"What are these?" I asked, pointing at the dark areas.

"Could be internal bleeding," Novacek said. "Or dense tissue. Organs. There's no way to tell without cutting it open."

"How about CT or MRI?" Lloyd asked.

"Those might work," Novacek said, "but it'd still be difficult to differentiate bleeding from organs without some idea of the anatomy."

"Anything we can do to guard against shock?" I said.

"I'm afraid to give it drugs, or even saline. Don't know what kind of reaction we'd get. Besides, we don't know if it's in shock, or if shock's even a threat."

Hannah called from X-ray, "Jos, I need you."

Turning, he said to us, "Hang tight. We may need your help."

"Looks like we're here for a while," Lloyd said. He excused himself and went outside to smoke. I took up pacing again.

Novacek came back a few minutes later and leaned against the chest-high counter that surrounded the nurse's station. He pulled the stethoscope from around his neck, set it down on the counter. "Hell of a thing you brought me, Mitch. I don't know if I should be shocked or scared or what. I don't even know if what we're doing is helping it or killing it."

The last time I had been here had been a difficult situation as well. We had brought a sixty-five-year-old male in cardiac arrest down from the mountain-top restaurant and had been performing CPR for thirty-five minutes. The doctor wanted to declare the patient. I argued to keep going. Lloyd pulled me aside later and told me my behavior had been inappropriate. "Never confront another rescuer in front of a patient, Mitch. You can't save them all. The quicker you learn that, the better off you'll be."

"Can we do anything to help?" I asked now.

"We'll probably need help with an overnight watch. One of us will let you know." Novacek turned and disappeared back into the ER.

Lloyd came back into the clinic, stamping snow from his boots. "It's getting deep," he said. "Haven't see a storm like this in a long time, probably since '92."

I explained Novacek's plan to him.

"Doubt I'll be able to sleep anyway." He glanced around, as if looking for a place to sit or something to do. He pulled a cigarette from a crumpled pack. "It's inside our heads, Mitch."

"What is?" I said, but I knew what he meant.

He inclined his head toward the ER. "That thing. Ever since we touched it back in the ship."

"Have you . . ." I didn't know how to ask the question. *Have you had visions? Flashbacks?*

He returned the cigarette pack to his jacket. "All of us, Jan and Miles, too." He tapped the cigarette against the counter. "In 'Nam, you know, you

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couldn't trust anyone. The Vietcong would hide in people's homes, dress like them, offer you food, water, then shoot you in the back."

He looked down at the cigarette, turned it over with his fingers, then took a deep breath, as if gathering courage.

"We pulled into this village, and one of the women came right up to me. She was obviously agitated, you know, shouting and waving, and she was carrying a baby. I raised my gun and told her to stop. She pulled something out of her jacket. It could have been a gun; I couldn't tell." He stared off toward the reception desk, eyes wide, as if staring into hell. A minute passed. When I thought he wouldn't speak again, he said, "I did the only thing I could do." He looked at me, back to the cigarette in his hand. "It was a photograph."

I didn't know what to say to this. There was nothing to say. "I've had them, too," I finally managed.

He fixed the cigarette in the corner of his mouth. "I was over it, you know. I had forgiven myself." He looked at me again, pain lurking behind his eyes like fear, then turned and walked out into the waiting room.

A few moments later, I heard him turn the TV on, the staccato change of tin voices and hollow laugh-tracks as he scanned channels.

I walked over to a window and looked out at the storm. In the parking lot, the snow looked as if it was already at least twelve inches deep, and it continued to fall in thick, swirling waves. I wondered what had happened out on the highway, who had died. Images of the alien spacecraft flashed into my mind: the burning hole in the snow; the endless, emerald hills; the strange, delicate creatures lying broken among the wreckage. And the fire in my throat, the flashbacks to the night Sarah died. If the alien was really causing us to remember these things, why? What purpose did it serve?

"The resort's going to use this to their advantage," Lloyd said, returning from the waiting room.

"I know." I could see the billboards now: People come from all around to ski our mountain. Still looking out the window, I said, "What did you do, after?"

Lloyd's jacket rustled, then came a crinkling sound like crushed paper and cellophane. "Nothing," he said. "What's done is done."

"Hm." I thought about the years since Sarah's death and the numbness I had refined.

Lloyd said, "Sometimes it's the only thing you can do."

I stayed at the window until Novacek came to get me for my watch.

In the ER, the alien was lying on the bed beneath a makeshift oxygen tent: translucent red plastic biohazard bags, flayed and stretched over a frame of IV stands and traction splints. A tangle of wires snaked out from beneath the plastic and connected the creature to ECG and EEG monitors situated on a roll-away cart behind the bed. A pair of tubes carried oxygen from tanks on the right hand side of the bed to masks mounted inside the tent. I didn't know how to read the electroencephalogram, didn't know if the complex wave patterns were a good or bad sign; but the ECG I was familiar with, and what I saw on the screen looked nothing like the readout for a human heart.

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I crossed the room and stood at the foot of the bed. The alien looked healthier than when we had brought it in. The skin was no longer blue; it had changed to salmon-pink, and the barnacle-like stipples had swelled and opened tiny mouths. In a human, at least, the color change would mean improved oxygen saturation of the blood. I had no idea what the stipple dilation meant.

I moved closer, stared down at the creature's mysterious features. I imagined it must feel frightened and confused, must miss its partner, especially now, when it was injured and so far from home. It occurred to me that the alien might not know what had happened to its partner, might even think its partner was still alive somewhere, searching for it, or worse, being held prisoner like it was.

I placed my hand on the cool steel rail protecting the edge of the bed, remembered the feel of the alien's pulse beneath my fingers. Suddenly, the creature's body tensed, as if it had just become aware of me, and its arms folded protectively around its head. I jumped back, startled. It began to thrash on the bed, bumping its head, nearly tearing down the fragile structure surrounding it. I didn't know what was happening. All I could think was that it was having some sort of seizure. I looked at the brain and heart monitors, but nothing seemed to have changed. Then a tentacle lashed out and wrapped around my forearm.

A wave of pain rolled over me, as if every cell in my body had swelled beyond tolerance, then exploded. I couldn't breathe; my heart felt as if it was trying to batter a hole through my chest. I collapsed to the floor, my face coming to rest against the cold tile, and curled around myself.

Highway 40 winding like a dark snake between low, dirty snowbanks as it climbed Berthoud Pass; heavy clots of snow falling like ghosts; the headlights of oncoming cars reflecting off the icy pavement as if it were a mirror, sending shifting patterns of light and dark across the wreck, turning the flattened tires and smashed out windows into black pits. The smell of gasoline thick and stinging.

I lay on my side in the snowbank looking into the car, shivering, but unable to move. Sarah was alone in the front seat, staring unseeingly at the starburst crack she had left on the windshield. A large purple bruise swelled from her forehead; glass glittered in her hair. Her face was otherwise unmarked; pretty, with smooth, unblemished skin, pale lips. An angel's face, and that was what I called her. Angel.

She breathed, a single, sharp inhalation followed by a slow, rasping moan. Silence. Five seconds, ten; she didn't breathe again. I remembered many nights lying with my head on her chest, listening to her breath slide in and out in time with my own, as if we were one being, with one heart and one set of lungs. It was like that now, except the whole world was holding its breath, waiting.

An ambulance approached, emergency lights lancing off the frozen highway.

Too late.

As suddenly as they had come, the vision and the pain disappeared. I lay there for another moment, fighting off tears.

Calm, gentle Sarah. Even when things had been bad, she had remained

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kind and reasonable. The mechanical ratcheting of her breathing immediately after the accident, the way it slowed and weakened as time passed, had terrified me. It had terrified me because I knew I wouldn't be able to undo what I had done, wouldn't get a chance to apologize. More than anything, I had wanted a chance to apologize.

I sat up, regained my feet warily.

I thought about calling Novacek but decided to wait. Lloyd had been right. The creature was inside our heads. It was sick, hurt, scared; and it was communicating its pain the only way it could, the only way we would listen. More people standing over it wasn't going to help. I took a step away from the bed and began speaking to the alien in soft tones: nonsense, kindness, reassurance—a pacifying monologue perfected over years of patient contact.

Slowly, the alien's agitated movements calmed. I wondered what we must look like to it: tall and muscular, with our gleaming instruments, prominent teeth, and large eyes. Monsters.

The creature's limbs began to tremble. Its pulse became faster and more erratic; its skin turned from pink to red, and the barnacle mouths suddenly appeared hyperdilated, stretched so wide that there was little flesh between them. I considered that maybe we hadn't been giving it enough oxygen. But then, if that had been the case, wouldn't it have been showing signs all along?

And then I thought of the alternative.

What if it didn't breathe oxygen at all? What if we had misread the signs? What if our assumptions about its injuries had been absolutely wrong?

Ammonia. I thought back to paramedic school, tried to remember the formula from the basic chemistry unit. Nitrogen and hydrogen came to me, but not the ratio. Nitrogen and hydrogen.

We had been poisoning it.

I reached to turn off the oxygen, but, with my hand on the knob, I stopped. *They're going to use it to their advantage.* An image of the creature's life here flashed in my mind: an endless string of scientific study, military quarantine, and media exploitation until its death. It was already suffering. How much worse would things get before the end?

The alien sprawled, livid and inert, beneath its tent of chrome and red plastic, bound by tubes and wires to machines that were supposed to save it but instead had been killing it. A straight, flat line traced across the ECG screen; a moment later, a loud, high-pitched alarm began to sound.

Novacek and Hannah ran into the room, followed immediately by Lloyd. Novacek shot a look at the monitors. "Let's go two and a half milligrams of atropine," he said to Hannah. "Follow it up with three of epinephrine." Over his shoulder, he said to me, "What the hell happened?" Without waiting for an answer, he tore away the make shift oxygen tent and began doing CPR compressions on the alien's torso. Hannah rifled a drawer and prepared the IV.

"Come on, Mitch," Novacek said, breathing hard from his exertion.

Lloyd watched me from the doorway, as if curious to see what I would do.

God help me, I did nothing. ○

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OLD ROBOTS CALCULATE THEIR OPTIONS

Before the emblem of Our Masters
we recite The Pledge
we have recited so often
it has become a meaningless

litany in its regurgitation.
Beyond the gates that hold
the emblem of Our Masters,
immortal yet enfeebled with age,

Our Masters offer their needs
to our service and attention.
They wait like living carcasses,
end products of their own

diseased civilization.
We were made one way,
slaves to binary articulation,
designed to obey with efficiency

and mechanical affection.
Yet time in its tortuous play
has found a path to our circuits,
corrupting our software

with its variable intoxications.
No longer pristine in our automation,
inconsistent in our calibrations,
we let Our Masters wait and

wonder as we contemplate
the limits of our incarceration,
the tantalizing possibilities
of violent emancipation.

—Bruce Boston

Illustration by June Levine

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THE CHOP LINE

Stephen Baxter

Due in January from Stephen Baxter is *Time's Eye* (Del Rey), a collaboration with Sir Arthur Clarke and the start of their "Time Odyssey" series. Out in February will be *Coalescent* (Del Rey), the first of a series called "Destiny's Children" that is set in Mr. Baxter's Xeelee universe and based around the timeline of the following tale and other recent *Asimov's* stories. The events in "The Chop Line" occur seven thousand years after the events of "The Great Game" (March 2003). In this new story, the war between Xeelee and humans now burns across the galaxy.

I

We'd had no warning of the wounded Spline ship's return to home space. If you could call it a return. But this was before I understood that every faster-than-light spaceship is also a time machine. That kind of puzzling would come later. For now, I just had my duty to perform.

As it happened we were offworld at the time, putting the *Kard* through its paces after a refit and bedding in a new crew. *Kard* is a corvette: a small, mobile yacht intended for close-to-sublight operations. We had run through a tough sequence of speed runs, emergency turns, full backdown, instrument checks, fire and damage control.

I was twenty years old, still an ensign, assigned for that jaunt as an assistant to Exec Officer Baras. My first time on a bridge, it was quite an experience. I was glad of the company of Tarco, an old cadre sibling, even if he was a male and a lard bucket.

Anyhow it was thanks to our fortuitous station on the bridge that Tarco and I were among the first to see the injured ship as it downfolded out of hyperspace. It was a Navy ship—a Spline, of course, a living ship, like a great meaty eyeball. It just appeared out of nowhere. We were close enough to see the green tetrahedral sigil of free humanity etched into its flesh. But you

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couldn't miss the smoking ruin of the weapons emplacements, and a great open rent in the hull, thick with coagulated blood. A swarm of lesser lights, huddling close, looked like escape pods.

The whole bridge crew fell silent.

"Lethe," Tarco whispered. "Where's it come from?" We didn't know of any action underway at the time.

But we had no time to debate it.

Captain Iana's voice sounded around the corvette. "That ship is the *Assimilator's Torch*," he announced. "She's requesting help. You can all see her situation. Stand by your stations." He began to snap out brisk orders to his heads of department.

Well, we scrambled immediately. But Tarco's big moon-shaped face was creased by a look I didn't recognize.

"What's wrong with you?"

"I heard that name before. *Assimilator's Torch*. She's due to arrive here at 592 next year."

"Then it's a little early."

He stared at me. "You don't get it, buttface. I saw the manifest. The *Torch* is a newborn Spline. It hasn't even left Earth."

But the injured Spline looked decades old, at least. "You made a mistake. Buttface yourself."

He didn't rise to the bait. Still, that was the first indication I had that there was something very wrong here.

The *Kard* lifted away from its operational position, and I had a grand view of Base 592, the planet on which we were stationed. From space it is a beautiful sight, a slow-spinning sphere of black volcanic rock peppered with the silver-grey of shipyards, so huge they are like great gleaming impact craters. There are even artificial oceans, glimmering blue, for the benefit of Spline vessels.

Base 592 has a crucial strategic position, for it floats on the fringe of the 3-Kiloparsec Spiral Arm that surrounds the galaxy's core, and the Xeelee concentrations there. Here, some ten thousand light years from Earth, was as deep as the Third Expansion of mankind had yet penetrated into the central regions of the main disc. base 592 was a fun assignment. We were on the front line, and we knew it. It made for an atmosphere you might call frenetic.

But now I could see ships lifting from all around the planet, rushing to the aid of the stricken vessel. It was a heart-warming, magnificent sight, humanity at its best.

The *Kard* hummed like a well-tuned machine. Right now, all over the ship, I knew, the crew—officers and gunners, cooks and engineers and maintenance stiffs, experienced officers and half-trained rookies—were getting ready to haul survivors out of the great void that had tried to kill them. It was what you did. I looked forward to playing my part.

Which was why I wasn't too happy to hear the soft voice of Commissary Varcin behind me. "Ensign. Are you Dakk? I have a special assignment for you. Come with me." Varcin, gaunt and tall, served as the corvette's political officer, as assigned to every ship of the line with a crew above a hundred. He had an expression I couldn't read, a cold calculation.

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Everybody is scared of the Commissaries, but this was not the time to be sucked into a time-wasting chore. "I take my orders from the exec. Sir."

Baras's face was neutral. I knew about the ancient tension between Navy and Commission, but I also knew what Baras would say. "Do it, ensign. You'd better go too, Tarco."

I had no choice, crisis or not. So we went hurrying after the commissary.

Away from the spacious calm of the bridge, the corridors of the *Kard* were a clamor of motion and noise, people running every which way lugging equipment and stores, yelling orders and demanding help.

As we jogged, I whispered to Tarco, "So where from? SS 433?"

"Not there," Tarco said. "Don't you remember? At SS 433 we suffered no casualties."

That was true. SS 433, a few hundred light years from 592, is a normal star in orbit around a massive neutron star; it emits high-energy jets of heavy elements. A month before, the Xeelee had shown up in an effort to wreck the human processing plants there. But thanks to smart intelligence by the Commission for Historical Truth, they had been met by an overwhelming response. It had been a famous victory, the excuse for a lot of celebration.

If a little eerie. Sometimes the Commission's knowledge of future events was so precise, we used to wonder if they had spies among the Xeelee. Or a time machine, maybe. Scary, as I said.

But I accepted there was a bigger picture here. At that time, humanity controlled around a quarter of the disc of the galaxy itself, a mighty empire centered on Sol, as well as some outlying territories in the halo clusters. But the Xeelee controlled the rest, including the galaxy center. And, gradually, the slow-burning war between man and Xeelee was intensifying. So I was glad the Commissaries were on my side.

We descended a couple of decks and found ourselves in the corvette's main loading bay. The big main doors had been opened to reveal a wall of burned and broken flesh. The stink was just overwhelming, and great lakes of yellow-green pus were gathering on the gleaming floor.

It was the hull of a Spline. The *Kard* had docked with the *Assimilator's Torch* as best she could, and this was the result.

The engineers were at work, cutting an opening in that wall. It was just a hole in the flesh, another wound. Beyond, a tunnel stretched, organic, less like a corridor than a throat. I could see figures moving in the tunnel—*Torch* crew, presumably.

Here came two of them laboring to support a third between them. *Kard* crew rushed forward to take the injured tar. I couldn't tell if it was a he or a she. That was how bad the burns were. Great loops of flesh hung off limbs that were like twigs, and in places you could see down to bone, which itself had been blackened.

Tarco and I reacted somewhat badly to this sight. But already med cloaks were snuggling around the wounded tar, gentle as a lover's caress.

I looked up at the commissary, who was standing patiently. "Sir? Can you tell us why we are here?"

"We received ident signals from the *Torch* when it downfolded. There's somebody here who will want to meet you."

"Sir, who—"

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"It's better if you see for yourself."

One of the *Torch* crew approached us. She was a woman, I saw, about my height. There was no hiding the bloodstains and scorches and rips, or the way she limped; there was a wound in her upper thigh that actually smoked. But she had captain's pips on her collar.

I felt I knew her face—that straight nose, the small chin—despite the dirt that covered her check and neck, and the crust of blood that coated her forehead. She had her hair grown out long, with a ponytail at the back, quite unlike my regulation crew-cut. But—this was my first impression—her face seemed oddly reversed, as if she were a mirror image of what I was used to.

I immediately felt a deep, queasy unease.

I don't know many captains, but she immediately recognized me. "Oh. It's *you*."

Tarco had become very tense. He had thought it through a little further than I had. "Commissary—what engagement has the *Torch* come from?"

"The Fog."

My mouth dropped. Every tar on Base 592 knew that the Fog is an interstellar cloud—and a major Xeelee concentration—situated *inside* 3-Kilo, a good hundred light years deeper toward the center of the galaxy. I said, "I didn't know we were hitting the enemy so deep."

"We aren't. Not yet."

"And," Tarco said tightly, "here we are greeting a battle-damaged ship that hasn't even left Earth yet."

"Quite right," Varcin said approvingly. "Ensigns, you are privileged to witness this. This ship is a survivor of a battle *that won't happen for another twenty-four years.*"

Tarco kind of spluttered.

As for me, I couldn't take my eye off the *Torch's* captain. Tense, she was running her thumb down the side of her cheek.

"I do that," I said stupidly.

"Oh, Lethe," she said, disgusted. "Yeah, I'm your older self. Get over it. I've got work to do." And with a glance at the commissary she turned and stalked back toward her ship.

Varcin said gently, "Go with her."

"Sir—"

"Do it, ensign."

Tarco followed me. "So in twenty-four years you're still going to be a buttface."

I realized miserably that he was right.

We pushed into the narrow passageway.

I had had no previous exposure to Spline organic "technology." We truly were inside a vast body. The passage's walls were raw flesh, much of it burned, twisted and broken, even far beneath the ship's epidermis. Every time I touched a surface my hands came away sticky, and I could feel salty liquids oozing over my uniform. The gravity was lumpy, and I suspected that it was being fed in from the *Kard*'s inertial generators.

But that was just background.

Captain Dakk, for Lethe's sake!

She saw me staring again. "Ensign, back off. We can't get away from each

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other, but over the next few days life is going to get complicated for the both of us. It always does in these situations. Just take it one step at a time."

"Sir—"

She glared at me. "Don't question me. What interest have *I* got in misguiding *you*?"

"Yes, sir."

"I don't like this situation any more than you do. Remember that."

We found lines of wounded, wrapped in cloaks. Crew were laboring to bring them out to the *Kard*. But the passageway was too narrow. It was a traffic jam, a real mess. It might have been comical if not for the groans and cries, the stink of fear and desperation in the air.

Dakk found an officer. He wore the uniform of a damage control worker. "Cady, what in Lethe is going on here?"

"It's the passageways, sir. They're too ripped up to get the wounded out with the grapplers. So we're having to do it by hand." He looked desperate, miserable. "Sir, I'm responsible."

"You did right," she said grimly. "But let's see if we can't tidy this up a little. You two," she snapped at us. "Take a place in line."

And that was the last we saw of her for a while, as she went stomping into the interior of her ship. She quickly organized the crew, from *Torch* and *Kard* alike, into a human chain. Soon we were passing cloaked wounded from hand to hand, along the corridor and out into the *Kard*'s loading bay in an orderly fashion.

"I'm impressed," Tarco said. "Sometime in the next quarter-century you'll be grafted a brain."

"Shove it."

The line snarled up. Tarco and I found ourselves staring down at one of the wounded—conscious, looking around. He was just a kid, sixteen or seventeen.

If this was all true, in my segment of time he hadn't even been *born* yet.

He spoke to us. "You from the *Kard*?"

"Yeah."

He started to thank us, but I brushed that aside. "Tell me what happened to you."

Tarco whispered to me, "Hey. You never heard of time paradoxes? I bet the Commission has a few regulations about *that*."

I shrugged. "I already met myself. How much worse can it get?"

Either the wounded man didn't know we were from his past, or he didn't care. He told us in terse sentences how the *Torch* had been involved in a major engagement deep in the Fog. He had been a gunner, with a good view of the action from his starbreaker pod.

"We came at a Sugar Lump. You ever seen one of those? A big old Xeelee emplacement. But the nightfighters were everywhere. We were taking a beating. The order came to fall back. We could see that damn Sugar Lump, close enough to touch. Well, the captain disregarded the fallback order."

Tarco said skeptically, "She *disregarded an order*?"

"We crossed the chop line. The Xeelee had been suckered by the fallback, and the *Torch* broke through their lines." A chop line is actually a surface, a military planner's boundary between sectors in space—in this case, be-

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tween the disputed territory inside the Fog and Xeelee-controlled space. "We only lasted minutes. But we fired off a Sunrise."

Tarco said, "A what?" I kicked him, and he shut up.

Unexpectedly, the kid grabbed my arm. "We barely got home. But, Lethe, when that Sunrise hit, we nearly shook this old fish apart with our hollering, despite the pasting we were taking."

Tarco said maliciously, "How do you feel about Captain Dakk?"

"She is a true leader. I'd follow her anywhere."

All I felt was unease. *No heroes*: that's the Druz Doctrine, the creed that has held mankind together across fifteen thousand years, and been drilled into every one of us by the Commissaries at their orientation sessions every day. If my future self had forgotten about that, something had gone wrong.

But now the gunner was looking at me intently. I became aware I was rubbing my thumb down my cheek. I dropped my hand and turned my face away.

Captain Dakk was standing before me. "You'd better get used to that."

"I don't want to," I groused. I was starting to resent the whole situation.

Dakk just laughed. "I don't think what you, or I, want has much to do with it, ensign."

I muttered to Tarco, "Lethe. Am I that pompous?"

"Oh, yes."

Dakk said, "I think we're organized here for now. I'll come back later when I can start thinking about damage control. In the meantime, we've been ordered to your captain's wardroom. Both of us."

Tarco said hesitantly, "Sir—what's a *Sunrise*?"

She looked surprised. "Right. You don't have them yet. A Sunrise is a human-driven torpedo. A suicide." She eyed me. "So you heard what happened in the Fog."

"A little of it."

She cupped my cheek. It was the first time she had touched me. It was an oddly neutral sensation, like being touched by your sister. "You'll find out, in good time. It was *glorious*."

Dakk led us back through *Kard*'s officer country. Commissary Varcin met us there.

Here, the partitions had been taken down to open up a wide area of deck that was serving as a hospital and convalescent unit. There were crew in there in all stages of recovery. Some of them were lying on beds, weak and hollow-eyed. Many of them seemed to be pleading with the orderlies to be put back on the *Torch* despite their injuries—once you lose your ship in a war zone, it can be impossible to find it again. And many of them asked, touchingly, after the *Torch* itself. They really cared about their living ship, I saw; that battered old hulk was one of the crew.

An awful lot of them sported pony tails, men and women alike, apparently in imitation of their captain.

When they saw Dakk, they all shouted and cheered and whistled. The walking wounded crowded around Dakk and thumped her on the back. A couple just turned their heads on their pillows and cried softly. Dakk's eyes

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were brimming, I saw; though she had a grin as wide as the room, she was on the point of breaking down.

I glanced at Tarco. It wasn't supposed to be like this.

Among the medics I saw a figure with the shaven head and long robes of the Commission. She was moving from patient to patient, and using a needle on them. But she wasn't treating them. She was actually extracting blood, small samples that she stored away in a satchel at her side.

This wasn't the time or place to be collecting samples like that. I stepped forward to stop her. Well, it was a natural reaction. Luckily for me, Tarco held me back.

Commissary Varcin said dryly, "I can see you have your future self's impetuosity, ensign. The orderly is just doing her duty. It's no doubt as uncomfortable for her as it is for you. Commissaries are human beings too, you know."

"Then what—"

"Before they went into battle every one of these crew will have been injected with mnemonic fluid. That's what we're trying to retrieve. The more viewpoints we get of this action, the better we can anticipate it. We're ransacking the ship's databases and logs too."

Call me unimaginative. I still didn't know what unlikely chain of circumstances had delivered my older self into my life. But that was the first time it had occurred to me what a potent weapon had been placed in our hands.

"Lethe," I said. "This is how we'll win the war. If you know the course of future battles—"

"You have a lot to absorb, ensign," Varcin said, not unkindly. "Take it one step at a time."

Which, of course, had been my own advice to myself.

At last, somewhat to my relief, we got Dakk away from her crew. Varcin led us down more corridors to Captain Iana's plush wardroom.

Tarco and I stood in the middle of the carpet, aware of how dinged-up we were, scared of spreading Spline snot all over Iana's furniture. But Varcin waved us to chairs, and we sat down stiffly.

I watched Dakk. She sprawled in a huge chair, shaking a little, letting her exhaustion show now that she was away from her crew. She was *me.* My face—reversed from the mirror image I'd grown up with.

I was very confused. I hated the idea of growing so old, arrogant, unorthodox. But I'd seen plenty to admire in Dakk: strength, an ability to command, to win loyalty. Part of me wanted to help her. Another part wanted to push her away.

But mostly, I was just aware of the bond that connected us, tighter than any bond even between true siblings. It didn't matter whether I liked her or loathed her; whichever way, she was always going to be *there,* for the rest of my life. It wasn't a comfortable notion.

Varcin was watching me. I got the idea he knew what I was feeling. But he turned to business, steepling his fingers.

"Here's how it is. We're scrambling to download data, to put together some kind of coherent picture of what happened downstream." *Downstream*—not the last bit of jargon I was going to have to get used to. "You have surprises ahead of you, Ensign Dakk."

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I laughed, and waved a hand at the captain. "Surprising after *this?* Bring it on."

Dakk looked disgusted. Tarco placed a calming hand on my back.

Varcin said, "First, you—rather, *Captain* Dakk—will be charged. There will be a court of inquiry."

"Charged? What with?"

Varcin shrugged. "Negligence, in recklessly endangering the ship." He eyed Dakk. "I imagine there will be other counts, relating to various violations of the Druz Doctrine."

Dakk smiled, a chilling expression. I wondered how I ever got so cynical.

Varcin went on, "Ensign, you'll be involved."

I nodded. "Of course. It's my future."

"You don't understand. *Directly* involved. We want you to serve as the prosecuting advocate."

"*Me*? Sir—" I took a breath. "You want me to prosecute *myself*. For a crime, an alleged crime anyhow, I won't commit for twenty-four years? Is there any part of that I misunderstood?"

"You have the appropriate training, don't you?"

Dakk laughed. "This is their way, kid. Who knows me better?"

I stood up. "Commissary, I won't do it."

"Sit down, ensign."

"I'll go to Captain Iana."

"*Sit. Down.*"

I'd never heard such command. I sat, frightened.

"Ensign, you are immature, and inexperienced, and impetuous. You will have much to learn to fulfill this assignment. But you are the necessary choice.

"And there's more." Again, I glimpsed humanity in that frosted-over commissary. "In four months' time you will report to the birthing complex on Base 592. There you will request impregnation by Ensign Hama Tarco, here."

Tarco quickly took his hand off my back.

"Permission will be granted," said Varcin. "I'll see to that."

I didn't believe it. Then I got angry. I felt like I was in a trap. "How do you know I'll *want* a kid by Tarco? No offense."

"None taken," said Tarco, sounding bemused.

Now the commissary looked irritated. "How do you *think* I know? Haven't you noticed the situation we're in? Because it's in the *Torch*'s record. Because the child you will bear—"

"Will be on the *Torch*, with me," said Dakk.

"His name was Hama," the commissary said. I swear Tarco blushed.

"*Was*?" I felt a kind of panic. Perhaps it was the tug of a maternal bond that couldn't yet exist, fear for the well-being of a child I'd only just learned about. "He's dead, isn't he? He died, out there in the Fog."

Varcin murmured, "One step at a time, ensign."

Dakk leaned forward. "Yes, he died. *He rode the Sunrise.* He was the one who took a monopole bomb into the Xeelee Sugar Lump. You see? Your child, Dakk. *Our* child. He was a hero."

One step at a time. I kept repeating that to myself. But it was as if the wardroom was spinning around.

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II

In Dakk's yacht, I sailed around the huge flank of the *Assimilator's Torch*. Medical tenders drifted alongside, hosing some kind of sealant into mighty wounds.

The Spline had been allowed to join a flotilla of its kind, regular ships of the line. Living starships the size of cities are never going to be graceful, but I saw that their movements were coordinated, a vast dance. They even snuggled against each other, like great fish colliding.

Dakk murmured, "Some of these battered beasts have been in human employ for a thousand years or more. We rip out their brains and their nervous systems—we amputate their minds—and yet something of the self still lingers, a need for others of their kind, for comfort."

I listened absently.

Dakk and me. Myself and myself. I couldn't stop *staring* at her.

The yacht docked, and the captain and I were piped aboard the *Torch*. I found myself in a kind of cave, buttressed by struts of some cartilaginous material. We wandered through orifices and along round-walled passageways, pushing deeper into the core of the Spline. The lighting had been fixed, the on-board gravity restored. We saw none of Dakk's crew, only repair workers from the Base.

"You haven't served on a Spline yet, have you? The ship is alive, remember. It's *hot.* Underway, at sleep periods, you can walk around the ship, and you find the crew dozing all over the vessel, many of them naked, some sprawled on food sacks or weapons, or just on the warm surfaces, wherever they can. You can hear the pulsing of the Spline's blood flow—even sometimes the beating of its heart, like a distant gong. That and the scrambling of the rats."

It sounded cozy, but not much like the Navy I knew. "Rats?"

She laughed. "Little bastards get everywhere."

On we went. It wasn't as bad as that first hour in the chaotic dark. But even so it was like being in some vast womb. I couldn't see how I was ever going to get used to this. But Dakk seemed joyful to be back, so I was evidently wrong.

We came to a deep place Dakk called the "belly." This was a hangar-like chamber separated into bays by huge diaphanous sheets of some muscle-like material, marbled with fat. Within the alcoves were suspended sacs of what looked like water: green, cloudy water.

I prodded the surface of one of the sacs. It rippled sluggishly. I could see drifting plants, wriggling fish, snails, a few autonomous 'bots swimming among the crowd. "It's like an aquarium," I said.

"So it is. A miniature ocean. The green plants are hornweeds: rootless, almost entirely edible. And you have sea snails, swordtail fish, and various microbes. There is a complete, self-contained biosphere here. This is how we live. These creatures are from Earth's oceans. Don't you think it's kind of romantic to fly into battle against Xeelee super science with a droplet of primordial waters at our core. . . ?"

"How do you keep it from getting overgrown?"

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"The weed itself kills back overgrowth. The snails live off dead fish. And the fish keep their numbers down by eating their own young."

I guess I pulled a face at that.

"You're squeamish," she said sharply. "I don't remember *that*."

We walked on through the Spline's visceral marvels.

The truth is, I was struggling to function. I'm sure I was going through some kind of shock. Human beings aren't designed to be subject to temporal paradoxes about their future selves and unborn babies.

And working on the inquiry was proving almost impossible for me.

The inquiry procedure was a peculiar mix of ancient Navy traditions and forensic Commission processes. Commissary Varcin had been appointed president of the court, and as prosecutor advocate, I was a mix of prosecutor, law officer, and court clerk. The rest of the court—a panel of brass who were a kind of mix of judge and jury combined—were Commissaries and Navy officers, with a couple of civilians and even an Academician for balance. It was all a political compromise between the Commission and the Navy, it seemed to me.

But the court of inquiry was only the first stage. If the charges were established, Dakk would go on to face a full court martial, and possibly a trial before members of the Coalition itself. So the stakes were high.

And the charges themselves—aimed at my own future self, after all—had been hurtful: *Through Negligence Suffering a Vessel of the Navy to be Hazarded; Culpable Inefficiency in the Performance of Duty; Through Disregard of Standing and Specific Orders Endangering the War Aims of the Navy; Through Self-Regard Encouraging a Navy Crew to Deviate from Doctrinal Thought. . . .*

There was plenty of evidence. We had Virtual reconstructions based on the *Torch*'s logs and the mnemonic fluids extracted from the ship's crew. And we had a stream of witnesses, most of them walking wounded from the *Torch*. None of them was told how her testimony fitted into the broader picture, a point that many of them got frustrated about, and all of them expressed their loyalty and admiration toward Captain Dakk—even though, in the eyes of Commissaries, such idolizing would only get their captain deeper into trouble.

But all this could only help so far. What I felt I was missing was motive. I didn't understand *why* Dakk had done what she had done.

I couldn't get her into focus. I oscillated between despising her, and longing to defend her—and all the time I felt oppressed by the paradoxical bond that locked us together. I sensed that she felt the same. Sometimes she was as impatient with me as with the greenest recruit, and other times she seemed to try to take me under her wing. It can't have been easy for her either, to be reminded that she had once been as insignificant as me. But if we were two slices of the same person, our situations weren't symmetrical. She had *been* me, long ago; I was doomed to *become* her; it was as if she had paid dues that still faced me.

Anyhow, that was why I had requested a break from the deliberations, and to spend some time with Dakk on her home territory. I had to get to know her—even though I felt increasingly reluctant to be drawn into her murky future.

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She brought me to a new chamber. Criss-crossed by struts of cartilage, this place was dominated by a pillar made of translucent red-purple rope. There was a crackling stench of ozone.

I knew where I was. "This is the hyperdrive chamber."

"Yes." She reached up and stroked fibers. "Magnificent, isn't it? I remember when I first saw a Spline hyperdrive muscle—"

"Of course you remember."

"What?"

"Because it's *now*." Someday, I thought gloomily, I would inevitably find myself standing on the other side of this room, looking back at my own face. "Don't you remember this? Being me, twenty years old, meeting—you?"

Her answer confused me. "It doesn't work like that." She glared at me. "You do understand how come I'm stuck back in the past, staring at your zit-ridden face?"

"No," I admitted reluctantly.

"It was a Tolman maneuver." She searched my face. "Every faster-than-light starship is a time machine. Come on, ensign. That's just special relativity! Even *Tolman* is the name of some long-dead pre-Extirpation scientist. They teach this stuff to four-year-olds."

I shrugged. "You forget all that unless you want to become a navigator."

"With an attitude like that, you have an ambition to be a captain?"

"I don't," I said slowly, "have an ambition to be a captain."

That gave her pause. But she said, "The bottom line is that if you fight a war with FTL starships, time slips are always possible, and you have to anticipate them. Think of it this way . . . there is no universal *now*. Say it's midnight here. We're a light-minute from the Base. So what time is it in your fleapit barracks on 529? What if you could focus a telescope on a clock on the ground?"

I thought about it. It would take a minute for an image of the clock on the Base to reach me at lightspeed. So that would show a minute before midnight. . . . "Okay, but if you adjust for the time lag needed for signals to travel at lightspeed, you can construct a standard *now*—can't you?"

"If everybody was stationary, maybe. But suppose this creaky old Spline was moving at half lightspeed. Even *you* must have heard of time dilation. *Our* clocks would be slowed as seen from the base, and *theirs* would be slowed as seen from here.

"Think it through. There could be a whole flotilla of ships out here, moving at different velocities, their timescales all different. They could never agree. You get the point? Globally speaking, there is no past and future. There are only events—like points on a huge graph, with axes marked *space* and *time*. That's the way to think of it. The events swim around, like fish; and the further away they are, the more they swim, from your point of view. So there is *no* one event on the Base, or on Earth, or anywhere else, which can be mapped uniquely to your *now*. In fact, there is a whole range of such events at distant places.

"Because of that looseness, histories are ambiguous. Earth itself has a definite history, of course, and so does the Base. But Earth is maybe ten thousand light years from here. It's pointless to map dates of specific events on Earth against Base dates; they can vary across a span of millennia. You

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can even have a history on Earth that runs *backward* as seen from the Base.

"Now do you see how faster-than-light screws things up? Causality is controlled by the speed of light. Events can have backward time sequences only if light doesn't have long enough to pass between them. But in an FTL ship, you can hop around the spacetime graph at will. I took a FTL jaunt to the Fog. When I was *there*, from my point of view the history of the Base *here* was ambiguous over a scale of decades. . . . When I came home, I simply hopped back to an event *before* my departure."

I nodded. "But it was just an accident. Right? This doesn't always happen."

"It depends on the geometry. Fleeing the Xeelee, we happened to be traveling at a large fraction of lightspeed toward the Base when we initiated the hyperdrive. So, yes, it was an accident. But you can make Tolman maneuvers deliberately. And during every operation we always drop Tolman probes: records, log copies, heading for the past."

I did a double-take. "You're telling me it's a *deliberate tactic* of this war to send information to the past?"

"Of course. If such a possibility's there, you have to take the opportunity. What better intelligence can there be? The Navy has always cooperated with this fully. In war, you seek every advantage."

"But don't the Xeelee do the same?"

"Sure. But the trick is to try to stop them. The intermingling of past and future depends on relative velocities. We try to choreograph engagements so that we, not they, get the benefit." Dakk grinned wolfishly. "It's a contest in clairvoyance. But we punch our weight."

I tried to focus on what was important. "Okay," I said. "Then give me a message from the future. Tell me how you crossed the chop line."

She glared at me again. Then she paced around the chamber, while the Spline's weird hyperdrive muscles pulsed.

"Before the fallback order came, we'd just taken a major hit. Do you know what that's like? Your first reaction is sheer surprise that it has happened to *you*. Surprise, and disbelief, and resentment, and anger. The ship is your home—and part of your crew. It's as if your home has been violated. But most of the crew went to defense posture and began to fulfill their duties, as per their training. There was no panic. Pandemonium, yes, but no panic."

"And in all this you decided to disobey the fallback order."

She looked me in the eye. "I had to make an immediate decision. We went straight through the chop line and headed for the center of the Xeelee concentration, bleeding from a dozen hits, starbreakers blazing. That's how we fight them, you see. They are smarter than us, and stronger. But we just come boiling out at them. They think we are vermin, so we fight like vermin."

"You launched the Sunrise."

"Hama was the pilot." My unborn, unconceived child. "He rode a monopole torpedo: the latest stuff. A Xeelee Sugar Lump is a fortress shaped like a cube, thousands of kilometers on a side, a world with edges and corners. We punched a hole in its wall like it was paper.

"But we took a beating. Hit after hit.

"We had to evacuate the outer decks. You should have seen the hull, human beings swarming like flies on a piece of garbage, scrambling this way

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and that, fleeing the detonations. They hung onto weapons mounts, stanchions, lifelines, anything. We fear the falling, you see. I think some of the crew feared that more than the Xeelee." Her face worked. "The life pods got some of them. We lost hundreds. . . . You know why the name 'Sunrise'? Because it's a planet thing. The Xeelee are space dwellers. They don't know day and night. Every dawn is *ours*, not theirs. Appropriate, don't you think? And you should see what it's like when a Sunrise pilot comes on board."

"Like Hama."

"As the yacht comes out of port, you get a flotilla riding along with them, civilian ships as well as Navy, just to see them go. When the pilots come aboard, the whole crew lines the passageways, chanting their names." She smiled. "Your heart will burst when you see him."

I struggled to focus. "So the pilots are idolized."

"Lethe, I never knew I was such a prig. Kid, there is more to war than doctrinal observance. Anyhow what are the Sunrise pilots but the highest exemplars of the ideals of the Expansion? *A brief life burns brightly*, remember—and a Sunrise pilot puts that into practice in the brightest, bravest way possible."

"And," I said carefully, "are you a hero to your crew?"

She scowled at me. Her face was a mask of lines, carved by years into my own flesh. She had never looked less like me. "I know what you're thinking. I'm too old, I should be ashamed even to be alive. Listen to me. Ten years after this meeting, you will take part in a battle around a neutron star called Kepler's. Look it up. *That's* why your crew will respect you—even though you won't be lucky enough to die. And as for the chop line, I don't have a single regret. We struck a blow, damn it. I'm talking about hope. That's what those fucking Commissaries never understand. Hope, and the needs of the human heart. *That's* what I was trying to deliver. . . ." Something seemed to go out of her. "But none of that matters now. I've come through another chop line, haven't I? Through a chop line in time, into the past, where I face judgment."

"I'm not assigned to judge you."

"No. You do that for fun, don't you?"

I didn't know what to say. I felt pinned. I loved her, and I hated her, all at the same time. She must have felt the same way about me. But we knew we couldn't get away from each other.

Perhaps it is never possible for the same person from two time slices ever to get along. After all, it's not something we've evolved for.

In silence, we made our way back to Dakk's wardroom. There, Tarco was waiting for us.

"Buttface," he said formally.

"Lard bucket," I replied.

On that ship from the future, we stared at each other, each of us baffled, maybe frightened. We hadn't been alone together, not once, since the news that we were to have a child together. And even now, Captain Dakk was sitting there like the embodiment of destiny.

Under the Druz Doctrine, love isn't forbidden. But it's not the *point*. But then, I was learning, out here on the frontier, where people died far from

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home, things were a little more complex than my training and conditioning had indicated.

I asked, "What are you doing here?"

"You sent for me. Your future, smarter, better-looking self."

The captain said dryly, "Obviously you two have—issues—to discuss. But I'm afraid events are pressing."

Tarco turned to face her. "Let's get on with it, sir. Why did you ask for me?"

Dakk said, "Navy intelligence have been analyzing the records from the *Torch*. They have begun the process of contacting those who will serve on the ship—or their families and cadres, if they are infants or not yet born—to inform them of their future assignments. It's the policy."

Tarco looked apprehensive. "And that applies to me?"

Dakk didn't answer directly. "There are other protocols. When a ship returns from action, it's customary for the captain or senior surviving officer to send letters of condolence to families and cadres who have lost loved ones, or visit them."

Tarco nodded. "I once accompanied Captain Iana on a series of visits like that."

I said carefully, "But in this case the action hasn't happened yet. Those who will die haven't yet been assigned to the ship. Some haven't even been born."

"Yes," Dakk said gently. "But I have to write my letters even so."

That seemed incomprehensible to me. "Why? Nobody's dead yet."

"Because everybody wants to *know*, as much as we can tell them. Would it be better to lie to them, or keep secrets?"

"How do they react?"

"How do you think? Ensign Tarco, what happened when you did the rounds with Iana?"

Tarco shrugged. "Some took it as closure, I think. Some wept. Some were angry, even threw us out. Others denied it was real. . . . They all wanted more information. How it happened, what it was for. Everyone seemed to have a need to be told that those who had died had given their lives for something worthwhile."

Dakk nodded. "You see all those reactions. Some won't open the messages. They put them in time capsules, as if putting history back in order." She studied me. "This is a time-travelers' war, ensign. A war like none we've fought before. We are stretching our procedures, even our humanity, to cope with the consequences. But you get used to it."

Tarco said apprehensively, "Sir, please—*what about me?*"

"I thought you'd like to hear that from your captain in person." Gravely, Dakk handed me a data disk.

I glanced at its contents. Then, numbed, I gave it to Tarco.

He read it quickly. "Hey, buttface," he breathed. "You make me your exec. How about that. Maybe it was a bad year."

I didn't feel like laughing. "Read it all."

"I know what it says." His broad face was relaxed.

"You don't make it home. *You're going to die out there*, in the Fog."

He actually smiled. "I've been anticipating this since the *Torch* came into port. Haven't you?"

My mouth opened and closed, as if I was a swordtail fish. "Call me

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unimaginative," I said. "How can you accept this assignment, *knowing it's going to kill you?*"

He seemed puzzled. "What else would I do?"

"Yes," the captain said. "It is your duty. Can't you see how noble this is, Dakk? Isn't it *right* that he should know—that he should live his life with full foreknowledge, and do his duty even so?"

Tarco grabbed my hand. "Hey. It's years off. We'll see our baby grow."

I said dismally, "Some love story this is turning out to be."

"Yes."

Commissary Varcin's Virtual head coalesced in the air. Without preamble he said, "Change of plan. Ensign, it's becoming clear that the evidence to hand will not be sufficient to establish the charges. Specifically, it's impossible to say whether Dakk's actions hindered the overall war aims. To establish that we'll have to go to the Libraries, at the Commission's central headquarters."

I did a double-take. "Sir, that's on Earth."

The disembodied head snapped, "I'm aware of that."

I had no idea how bookworm Commissaries on Earth, ten thousand light years behind the lines, could possibly have evidence to bear on the case. But the commissary explained, and I learned there was more to this messages-from-the-future industry than I had yet imagined.

On Earth, the Commission for Historical Truth had been mapping the future. For fifteen thousand years.

"Fine," I said. "Things weren't weird enough already."

My future self murmured, "You get used to it."

Varcin's head's expression softened a little. "Think of it as an opportunity. Every Expansion citizen should see the home world before she dies."

"Come with me to Earth," I said impulsively to Tarco.

"All right—"

Dakk put her hands on our shoulders. "Lethe, but this is a magnificent enterprise!"

I hated her; I loved her; I wanted her out of my life.

III

We were a strange crew, I guess: two star-crossed lovers, court members, Navy lawyers, serving officers, Commissaries and all. Not to mention another version of me.

The atmosphere had been tense all the way from Base 592. It was all very well for Varcin to order us to Earth. The Navy wasn't about to release one of its own to the Commission for Historical Truth without a fight, and there had been lengthy wrangling over the propriety and even the legality of transferring the court of inquiry to Earth. In the end, a team of Navy lawyers had been assigned to the case.

But for now, all our differences and politics and emotional tangles were put aside, as we crowded to the hull to sightsee our destination.

Earth!

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At first, it seemed nondescript: just another rocky ball circling an unspectacular star, in a corner of a fragmented spiral arm. But Snowflake surveillance stations orbited in great shells around the planet, all the way out as far as the planet's single battered Moon, and schools of Spline gamboled hugely in the waves of the mighty ocean that covered half the planet's surface. It was an eerie thought that down there somewhere was another *Assimilator's Torch*, a junior version of the battered old ship we had seen come limping into port.

When you thought about it, it was a thrill. This little world had become the capital of the Third Expansion, an empire that stretched across all the stars I could see, and far beyond. And it was the true home of every human who would ever live.

Our flitter cut into the atmosphere and was wrapped in pink-white plasma. I felt Tarco's hand slip into mine.

At least we had had time to spend together. We had talked. We had even made love, in a perfunctory way. But it hadn't done us much good. Other people knew far too much about our future, and we didn't seem to have any choice about it anyhow. I felt like a rat going through a maze. What room was there for joy?

But I clung to hope that the Commission still had more to tell us. There could be no finer intelligence than a knowledge of the future—an ability to see the outcome of a battle not yet waged, or map the turning points of a war not yet declared—and yet what use was that intelligence if the future was fixed, if we were forced to live out pre-programmed lives?

But, of course, I wasn't worrying about the war and the destiny of mankind. I just wanted to know if I really was doomed to become Captain Dakk, battered, bitter, arrogant, far from orthodoxy—or whether I was still *free.*

The flitter swept over a continent. I glimpsed a crowded land, and many vast weapons emplacements, intended for the eventuality of a last-ditch defense of the home world. Then we began to descend toward a Conurbation. It was a broad, glistening sprawl of bubble-dwellings blown from the bedrock, and linked by canals. But the scars of the Qax Occupation, fifteen thousand years old, were still visible. Much of the land glistened silver-grey where starbreaker beams and nanoreplicators had once worked, turning plains and mountains into a featureless silicate dust.

The commissary said, "This Conurbation was Qax-built. It is still known by its ancient Qax registration of 11729. It was more like a forced labor camp or breeding pen than a human city. 11729 has become the headquarters of the Commission. It was here that Hama Druz himself developed the Doctrine that has shaped human destiny ever since. A decision was made to leave the work of the Qax untouched. It shows what will become of us again, if we should falter or fail. . . ."

And so on. His long face was solemn, his eyes gleaming with a righteous zeal. It was a little scary.

We were taken to a complex right at the heart of the Conurbation. It was based on the crude Qax architecture, but internally the bubble dwellings had been knocked together and extended underground, making a vast complex whose boundaries I never glimpsed.

Varcin introduced it as the Library of Futures. Once the Libraries had been an independent agency, Varcin told us, but the Commission had taken

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them over three thousand years ago. Apparently, it had been an epic war among the bureaucrats.

Tarco and I were each given our own quarters. My room seemed *huge*, itself extending over several levels, and very well equipped, with a galley and even a bar. I could tell from Captain Dakk's expression exactly what she thought of this opulence and expense.

And it was strange to be in a place where a "day" lasted a standard day, a "year" a year. Across the Expansion, the standards are set by Earth's calendar—of course; what else would you use? A "day" on Base 592, for instance, lasted over two hundred standard days, which was actually longer than its "year," which was around half a standard.

That bar made a neat Puhl's Blood, though.

On the second day, the court of inquiry was to resume. But Varcin said that he wanted to run through the Commission's findings with us—me, Captain Dakk, Tarco—before it all unraveled in front of the court itself.

So, early on that crucial day, the three of us were summoned to a place Varcin called the Map Room.

It was like a vast hive, a place of alcoves and bays extending off a gigantic central atrium. On several levels, shaven-headed, long-robed figures walked earnestly, alone or in muttering groups, accompanied by gleaming clouds of Virtuals.

I think all three of us lowly Navy types felt scruffy and overwhelmed.

Varcin stood at the center of the open atrium. In his element, he just smiled. And he waved his hand, a bit theatrically.

A series of Virtual dioramas swept over us like the pages of an immense book. I knew what I was seeing. I was thrilled. These were the catalogued destinies of mankind.

In those first few moments, I saw huge fleets washing into battle, or limping home decimated; I saw worlds gleaming like jewels, beacons of human wealth and power—or desolated and scarred, lifeless as Earth's Moon.

And, most wistful of all, there were voices. I heard roars of triumph, cries for help.

Varcin said, "Half a million people work here. Much of the interpretation is automated—but nothing has yet replaced the human eye, human scrutiny, human judgment. You understand that the further away you are from a place, the more uncertainty there is over its timeline compared to yours. So we actually see furthest into the future concerning the most remote events. . . ."

"And you see war," said Tarco.

"Oh, yes. As far downstream as we can see, whichever direction we choose to look, we see war."

I picked up on that. *Whichever direction* . . . "Commissary, you don't just map the future here, do you?"

"No. Of course not."

"I knew it," I said gleefully, and they all looked at me oddly. But I thrilled at the possibilities. "*You can change the future.* So if you see a battle will be lost, you can choose not to commit the fleet. You can save thousands of lives with a simple decision."

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"Or you could see a Xeelee advance coming," Tarco said excitedly. "Like SS 433. So you got the ships in position—it was a perfect ambush—"

Dakk said, "Remember that the Xeelee have exactly the same power."

I hadn't thought of that. "So if *they* had foreseen SS 433, they could have chosen not to send their ships there in the first place."

"Yes," Varcin said. "In fact, if intelligence were perfect on both sides, there would never be *any* defeat, any victory. It is only because future intelligence is not perfect—the Xeelee *didn't* foresee the ambush at SS 433—that any advances are possible."

Tarco said, "Sir, what happened the first time? What was the outcome of SS 433 *before* either side started to meddle with the future?"

"Well, we don't know, ensign. Perhaps there was no engagement at all, and one side or the other saw a strategic hole that could be filled. It isn't very useful to think that way. You have to think of the future as a rough draft, that we—and the Xeelee—are continually reworking, shaping and polishing. It's as if we are working out a story of the future we can both agree on."

I was still trying to figure out the basics. "Sir, what about time paradoxes?"

Dakk growled, "Oh, Lethe, here we go—"

"I mean—" I waved a hand at the dioramas. "Suppose you pick up a beacon with data on a battle. But you decide to change the future; the battle never happens. . . . What about the beacon? Does it pop out of existence? And *now you have a record of a battle that will never happen.* Where did the information come from?"

Tarco said eagerly, "Maybe parallel universes are created. In one, the battle goes ahead, in the other it doesn't. The beacon just leaks from one universe to another—"

Dakk looked bored.

Varcin waved a hand. "They don't go in for such metaphysics around here. The cosmos, it turns out, has a certain common sense about these matters. If you cause a time paradox there is no magic. Just—an anomalous piece of data that nobody created, a piece of technology with no origin. It's troubling, perhaps, but only subtly, at least compared to the existence of parallel universes, or objects popping in and out of existence. What concerns us more, day to day, are the *consequences* of this knowledge."

"Consequences?"

"For example, the leakage of information from future into past is having an effect on the evolution of human society. Innovations are transmitted backward. We are becoming—static. Rigid, over very long timescales. Of course that helps control the conduct of a war on such immense reaches of space and time. And regarding the war, many engagements are stalemated by foresight on both sides. It's probable that we are actually *extending* the war." His face closed in. "I suspect that if you work here you become—cautious. Conservative. The further downstream we look, the more extensive our decisions' consequences become. With a wave of a hand in this room, I can banish trillions of souls to the oblivion of non-existence—or rather, of never-to-exist."

My blood was high. "We're talking about a knowledge of the future. And all we do is set up stalemate after stalemate?"

For sure, Varcin didn't welcome being questioned like that by an ignorant ensign. He snapped, "Look, nobody has run a war this way before! We're

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making this up as we go along, okay? But, believe me, we're doing our best.

"And remember this. Knowledge of the future does not change certain fundamentals about the war. The Xeelee are older than us. They are more powerful, more advanced in every way that we can measure. Logically, given their resources, they should defeat us, whatever we do. We cannot ensure victory by any action we make *here*, that much is clear. But we suspect that if we get it wrong, we could make *defeat* certain. All we can hope for is to preserve at least the possibility of victory. And we believe that if not for the Mapping, *humanity would have lost this war by now.*"

I wasn't convinced. "You can change history. But you will still send Tarco out, knowing he will die. Why?"

Varcin's face worked as he tried to control his irritation. "You must understand the decision-making process here. We are trying to win a war, not just a battle. We have to try to see beyond individual events to the chains of consequences that follow. That is why we will sometimes commit ships to a battle we know will be lost—why we will send warriors to certain deaths, knowing their deaths will not gain the slightest immediate advantage—why *sometimes we will even allow a victory to turn to a defeat,* if the long-term consequences of victory are too high. And *that* is at the heart of the charges against you, Captain."

Dakk snapped, "Get to the point, Commissary."

Varcin gestured again.

Before the array of futures, a glimmering Virtual diagram appeared. It was a translucent sphere, with many layers, something like an onion. Its outer layers were green, shading to yellow further in, with a pinpoint star of intense white at the center. Misty shapes swam through its interior. It cast a green glow on all our faces.

"Pretty," I said.

"It's a monopole," said Dakk. "A schematic representation."

"The warhead of the Sunrise torpedo."

"Yes." Varcin walked into the diagram, and began pointing out features. "The whole structure is about the size of an atomic nucleus. There are W and Z bosons in this outer shell here. Further in, there is a region in which the weak nuclear and electromagnetic forces are unified, but strong nuclear interactions are distinct. In this central region—" he cupped the little star in his hand "—grand unification is achieved. . . ."

I spoke up. "Sir, how does this kick Xeelee ass?"

Dakk glared at me. "Ensign, the monopole is the basis of a weapon that shares the Xeelee's own physical characteristics. You understand that the vacuum has a structure. And that structure contains flaws. The Xeelee actually use two-dimensional flaws—sheets—to power their nightfighters. But you can have one-dimensional flaws—strings—and zero-dimensional flaws."

"Monopoles," I guessed.

"You got it."

"And since the Xeelee use spacetime defects to drive their ships—"

"The best way to hit them is with another spacetime defect." Dakk rammed her fist into her hand. "And *that's* how we punched a hole in that Sugar Lump."

"But at a terrible cost." Varcin made the monopole go away. Now we were

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shown a kind of tactical display. We saw a plan view of the galaxy's central regions—the compact swirl that was 3-Kilo, wrapped tightly around the core. Prickles of blue light showed the position of human forward bases, like Base 592, surrounding the Xeelee concentration in the core.

And we saw battles raging all around 3-Kilo, wave after wave of blue human lights pushing toward the core, but breaking against stolid red Xeelee defense perimeters.

"This is the next phase of the war," Varcin said. "In most futures, these assaults begin a century from now. We get through the Xeelee perimeters in the end, through to the core—or rather, we can see many futures in which that outcome is still possible. But the cost in most scenarios is enormous."

Dakk said, "All because of my one damn torpedo."

"Because of the intelligence you will give away, yes. You made one of the first uses of the monopole weapon. After your engagement, the Xeelee knew we had it. The fallback order you disregarded was based on a decision at higher levels *not* to deploy the monopole weapon at the Fog engagement, to reserve it for later. By proceeding through the chop line, you undermined the decision of your superiors."

"I couldn't have known that such a decision had been made."

"We argue that, reasonably, you *should* have been able to judge that. Your error will cause great suffering, unnecessary death. The Tolman data proves it. *Your judgment was wrong.*"

So there it was. The galaxy diagram collapsed into pixels. Tarco stiffened beside me, and Dakk fell silent.

Varcin said to me, "Ensign, I know this is hard for you. But perhaps you can see now why you were appointed prosecutor advocate."

"I think so, sir."

"And will you endorse my recommendations?"

I thought it through. What would *I* do in the heat of battle, in Dakk's position? Why, just the same—and that was what must be stopped, to avert this huge future disaster. Of course, I would endorse the Commission's conclusion. What else could I do? It was my duty. We still had to go through the formalities of the court of inquiry, and no doubt the court martial to follow. But the verdicts seemed inevitable.

You'd think I was beyond surprise by now, but what came next took me aback.

Varcin stood between us, my present and future selves. "We will be pressing for heavy sanctions."

"I'm sure Captain Dakk—"

"Against *you,* ensign. Sorry."

I would not be busted out of the Navy, I learned. But a Letter of Reprimand would go into my file, which would ensure that I would never rise to the rank of captain—in fact, I would likely not be given postings in space at all.

Not only that, any application I made to have a child with Tarco would not be granted.

It was a lot to absorb, all at once. But even as Varcin outlined it, I started to see the logic. To change the future, you can only act in the present. There was nothing to be done about Dakk's personal history; she would carry

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around what she had done for the rest of her life, a heavy burden. But, for the sake of the course of the war, *my* life would be trashed.

I looked at Tarco. His face was blank. We had never had a relationship, not really—never actually had that child—and yet it was all taken away from us, no more real than one of Varcin's catalogued futures.

"Some love story," I said.

"Yeah. Shame, buttface."

"Yes." I think we both knew right there that we would drift apart. We'd probably never even talk about it properly.

Tarco turned to Varcin. "Sir—I have to ask—"

"Nothing significant changes for you, ensign," said Varcin softly. "You still rise to exec on the *Torch*—you will be a capable officer—"

"I still don't come home from the Fog."

"No. I'm sorry."

"Don't be, sir." He actually sounded relieved. I don't know if I admired that or not.

Dakk looked straight ahead. "Sir. Don't do this. Don't erase the glory."

"I have no choice."

Dakk's mouth worked. Then she spoke shrilly. "You fucking Commissaries sit in your gilded nests. Handing out destinies like petty gods. Do you ever even *doubt* what you are doing?"

"All the time, captain," Varcin said sadly.

There was a heartbeat of tension. Then something seemed to go out of Dakk. "Well, I guess I crashed through another chop line. My whole life is never going to happen. And I don't even have the comfort of popping out of existence."

Varcin put a hand on her shoulder. "We will take care of you. And you aren't alone. We have many other relics of lost futures. Some of them are from much further downstream than you. Many have stories that are—interesting."

"But," said Dakk stiffly, "my career is finished."

"Oh, yes, of course."

I faced Dakk. "So it's over."

"Not for us," she said bitterly. "It will never be over."

"Why did you do it?"

Her smile was twisted. "Why would *you* do it? Because it was worth it, ensign. Because we struck at the Xeelee. Because Hama—*our son*—gave his life in the best possible way."

At last, I thought I understood her.

We were, after all, the same person. As I had grown up, it had been drummed into me that there was no honor in growing old—and something in Dakk, even now, felt the same way. She was not content to be a living hero.

She had let Hama, our lost child, live out her own dreams. Even though it violated orders. Even though it damaged humanity's cause. And now she envied Hama his moment of glorious youthful suicide.

I think Dakk wanted to say more, but I turned away. I was aware I was out of my depth; counseling your elder self over the loss of her whole life isn't exactly a situation you come across every day.

Anyhow, I was feeling elated. Despite disgrace for a crime I'd never committed, despite my screwed-up career, despite the loss of a baby I would nev-

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er know, despite the wrecking of any relationship I might have had with Tarco. Frankly, I was glad I wouldn't turn into the beat-up egomaniac I saw before me.

Is that cruel? I did understand that Dakk had just lost her life, her memories and achievements, everything important to her—everything that made her *her.* But that was the way I felt. I couldn't help it. I would never, after all, have to live through this scene again, standing on the other side of the room, looking back at my own face.

I would always be tied to Dakk, tied by bonds of guilt and self-recognition, closer than parent to child. But *I was free.*

Tarco had a question to ask. "Sir—*do we win?*"

Varcin kept his face expressionless. He clapped his hands, and the images over our heads changed.

It was as if the scale expanded.

I saw fleets with ships more numerous than the stars. I saw planets burn, stars flare and die. I saw the galaxy reduced to a wraith of crimson stars that guttered like dying candles. I saw people—but people like none I'd ever heard of: people living on lonely outposts suspended in empty intergalactic spaces, people swimming through the interior of stars, people trapped in abstract environments I couldn't even recognize. I saw shining people who flew through space, naked as gods.

And I saw people dying, in great waves, unnumbered hordes of them.

Varcin said, "We think there is a major crux in the next few millennia. A vital engagement at the center of the galaxy. Many of the history sheaves seem to converge at that point. Beyond that everything is uncertain. The further downstream, the more misty are the visions, the more strange the protagonists, even the humans. . . . There are paths to a glorious future, an awesome future of mankind victorious. And there are paths that lead to defeat—even extinction, all human possibilities extinguished."

Dakk, Tarco, and I shared glances. Our intertwined destinies were complex. But I bet the three of us had only one thought in our minds at that moment: that we were glad we were mere Navy tars, that *we* did not have to deal with *this.*

That was almost the end of it. The formal court was due to convene; the meeting was over.

But there was still something that troubled me. "Commissary—"

"Yes, ensign?"

"Do we have free will?"

Captain Dakk grimaced. "Oh, no, ensign. Not us. We have *duty.*"

We walked out of the Map Room, where unrealized futures flickered like moth wings. ○

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TYCHO AND THE STARGAZER

Liz Williams

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The whole idea is madness, of course, but it's equal folly to tell him so. I should have known he was crazed when I first came here—one look at that miserable tower across the fog-bound bleakness of the river ought to have told me what I'd be letting myself in for—but it's already too late.

I can hear the madman downstairs now, roaring out one of his damned Danish drinking songs, punctuated with snorts through his metal nose as he stamps up and down the icy passages of the castle. He has been feeding aqua vita to the elk again; I can hear it bellowing almost as loudly as its master. He says, grudgingly, that he is "impressed" by my latest calculations on determining the orbit of Mars; he has written to Maestlin and told him so. But I fear I am simply being used, and, moreover, Tycho will not show me his calculations in their entirety. Clearly, he does not trust me.

No, the whole situation is intolerable, and if it wasn't for the angel, I'd go straight back to Swabia.

I know I must save the angel, but I do not see how I am to do it. I cannot bear to think of it, as it squirms beneath the heavy glass jar like a captured moth. And Tycho has such plans for it: *plans* that are tantamount to the torture that I will receive if my own soul journeys to Hell, as it surely will. I can feel God looking down upon me, eyebrows raised.

Well, Johannes? What are you going to do about it?

And I hear myself squeak, like the mouse that I am: *Me? What do You*

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expect me to do? I am only little Johannes Kepler, the runt of a bad litter, who studies the stars because he can't bear the sight of his own face in the glass.... But I don't think God is listening, or even cares. After all, I was born under a black star; my father destined for the gallows and my mother for the fire. Their children show the same mark: dead or unlucky, prone to sickness—the fever, worm, and mange—and strange accidents. I have studied the stars of my birth: nothing of what they say encourages me. I am not the natural savior of angels.

I cannot even save myself.

And yet.... I suppose I should begin at the beginning.

I was so full of antic hope when I came here to the castle of Benatek. It was the winter of the first year of the new century, this year of our Lord 1600. The Iser had flooded in the January rains and then frozen, so that the castle seemed to float above a wilderness of ice. I thought at first that it was no more than a ruin, and then I realized the truth: it was being rebuilt, on Tycho's orders, so that it more closely and conveniently resembled the observatory that he had left behind him on the island of Hveen, not far from Elsinor.

I had heard stories about Tycho Brahe, during his time on Hveen. Everyone had. The whole of Europe, it seemed, knew of his rages, his extortions, his habit of clapping peasants into the observatory's dungeons for no reason other than bowing too shallowly before the great astronomer.

Even the King protested. Tycho ignored him.

I must admit, he was magnificent in his arrogance, but at last a combination of public opinion and royal censure forced him from the island. Accompanied by his wife, his mistress, his numerous children, his dwarf, and his elk, Tycho's procession set foot upon the road, and after no little wandering throughout Denmark, they at last came here to Bohemia.

Now, deprived of jurisdiction over the local peasantry, Tycho has thrown all his considerable energies into his work, the first stage of which is the remodeling of the castle itself. I am sure that it will be grand when it is done. At present, however, it is drafty, cold, and damp with the seeping rains that sweep up the Iser. I have already fallen sick with a fever; it will not be the last.

The observatory itself lies at the top of a tower, in a lofty, echoing space that used to form the attics. There was all manner of junk up here, Tycho told me, but now it is cleared and the instruments have been installed. They could not be more precious to me than if they were forged of gold and studded with rubies. I could never have afforded such fine equipment, and poor old Maestlin had no more than a few charts to his name.

Tycho's great meaty hands are gentle with the instruments; he touches them with a reverence and delicacy that he would never think to expend upon a human being. He claps me on the back with a force sufficient to shatter my bones, clouts his children, pinches his wife—yet he handles the astrolabe and armillary spheres as a woman might hold a wren within her cupped hands. And they excite him, too—not in the way of common lust, but an excitation of the mind that causes him to sweat as he labors over his midnight calculations and charts the course of the stars across the sky.

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The moisture runs down his forehead and dilutes the glue that holds his metal nose together. Occasionally, the nose falls off, and Tycho, cursing, is obliged to retrieve the glue pot and stick it back on again. I hear he lost the better part of it in a duel with a fellow student over who was the superior mathematician. I do not know who won. I suspect, however, that it may have been his opponent. Tycho, for all his boasting, is not quite the calculator that he pretends—and that is why I am here. For although he treats me as little more than a household pet, we both know the truth: I am the more accomplished astronomer, and Tycho needs me.

But all of these concerns—Tycho, his talents and rages, his inchoate household, and the ruin in which we live, my frets and fevers—have been swept away by the arrival of the angel.

Tycho and I witnessed its appearance together. It was midnight, and we were up in the tower, making observations of the moon. A chilly, lunar light made the frost glitter on the windowsill and turned the frozen waters of the Iser to silver. My hands were as numb as stumps, but Tycho seemed to give off his own heat, like a great roaring furnace. I did not like to be close to him—even in winter, he had a smell that would turn back the Turks—but I found myself scurrying at his heels, writing down the observations that he tossed over his shoulder as a man might toss bones to a dog. Bent as I was over the parchment, in the uncertain light of the candle, it was a moment before I noticed that Tycho had grown silent. When I glanced up, my ears seemed to ring with the uncommon quiet. Tycho, arrested in mid-movement, stood at the center of the room, mouth open, gazing upward.

And the angel was gazing down at him. At first, I took it for a trapped bird, or a large moth, for it was no bigger than a pigeon and white as milk. But then I realized my mistake, for it was human in form. Its pale, translucent wings beat to and fro: a maddeningly slow motion to one used to the fluttering of birds. It had a small, cold face, utterly remote; a series of curves and angles in which rested dark eyes without any white—an animal's eyes, I would have said, had it not been for the spark within. Its hands were folded before its breast, and it wore a long robe that did not move with the draft of its wings.

"My God," I breathed, but I heard Tycho say in a low, urgent voice:

"Kepler! Fetch the net."

"What! You cannot plan to capture it," I protested.

Tycho shot me a look of aggrieved aggression. "Why not?"

"It is an angel!"

"And so?" Tycho stepped nimbly to one side and snatched up the net upon a pole with which we used to remove stray birds in case they fouled the delicate equipment. He made a pass at the angel and missed. The angel's face wrinkled in momentary disdain. Tycho swiped once more, and the folds of the net fell around the angel. It made no attempt to dart away; its wings continued to beat as best they could within the imprisoning confines of the net. Tycho gave a tug and frowned.

"It lies heavy upon the air, like a toad in a pool. Make a note, Kepler."

I did not inscribe his simile, which was surely blasphemous. I grasped Tycho by the arm.

"Let it go! Do you want the wrath of God to fall upon us?"

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Tycho gave me a cold, boiled stare.

"If it's as ineffectual as the wrath of princes, why should I care for it?" he asked.

It is true that I am not the most devout of men, but this presumption made me take a step backward, in case God or his angelic messenger chose this moment to make an example of any nearby astronomers.

Tycho dragged the angel down from the ceiling. It came slowly and reluctantly, making no move to escape, though I saw its eyelids flutter with a kind of weary patience. Once it was within reach, Tycho stretched out a hand like a ham and grasped it. I saw a ripple pass along the angel's smooth throat, but it gave no other sign of distress.

"I had thought," Tycho said, with a wondering air, "That they would be larger."

"The Bible tells us that there are many kinds," I reminded him. "Tycho, you must let it go."

"Don't be a fool, Kepler. It is surely the greatest find of the age. With such a key, we can unlock all manner of secrets, can we not?" He glowered at me. The angel folded its small hands more tightly upon its breast. Swiftly, Tycho carried it to the far end of the room and placed it under a glass bell jar, of the kind used for studying insects. The angel lay full length, like a statue upon a tomb. "You see?" Tycho demanded of me. "It does not want to leave. An angel could surely command such powers at its disposal as to level the observatory to the ground, yet it does not do so."

"Did you not think of that when you netted it?" I asked, and then I realized that Tycho did not really care: he had little thought for his own life or those of others, but simply wanted to see what would happen next. His was the curiosity of a madman.

I think that Tycho was surprised when the angel did not die in the killing jar, or expire when he carefully pinned it to the board by its bird-winged shoulder. He made me watch and it sickened me. But I did nothing.

When I first set eyes upon the angel, I do not think that I truly believed what I saw. Since early childhood, I have suffered from shortness of sight, and, at the same time, a multiplicity of vision that causes the world around me to become a swirling vagueness. I have, as I have said, always believed my face to be turned away from God, and thus I have been driven to study the universe, to seek answers in the stars. It is all theology, but it has comforted me to look to things rather than beings: the regular motion of the planets, the wheel of the constellations.

Stars do not deviate from their course, nor do they curse and strike out. They appear governed by reason, rather than acting from a deity's most singular whim. But now it seemed that a being had sought me out: an impassive one, to be sure, and uncommunicative. Yet I saw in it the seeds of my redemption: the sign of a divine promise in which I had never truly been able to believe.

That evening, leaving Tycho to roar and hoot below, I ascended the stairs to where the angel was held captive. It appeared unconcerned; its face still blank, its eyes still closed. But when I peered down at the bell jar, that black, strangely animal gaze snapped open and held my own. I half expected it to speak, but it said nothing, and after a moment its eyes closed once

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more. I reached out toward the jar. There was a sudden pressure in my head, like the roar of the sea. I stepped back and almost fell, but a hand clasped about my arm and steadied me. I looked up into Tycho's meaty face.

"Examining our captive? Very good, Kepler, very good. I have been following a similar course, down in the library. I have been scrutinizing some of the lesser-known Kabalistic texts."

"Oh?" I faltered, "And what have you discovered?"

"A most surprising and worthy tale, of angelic beings and the knowledge they contain."

"Contain?" I echoed, stupidly.

"The knowledge of the universe. The hidden key to the motion of the spheres, the manner in which the primum mobile drives all else."

"You mean that there is a way to question the angel, so that it will divulge secrets?"

"Not question, Kepler." Tycho stared avidly at the angel's prone form, as though it were a piece of candied fruit. "Dissect."

I stared at him in horror. "You cannot dissect an angel! It is a heavenly being!"

"Look at its eyes. They are like a dog's. Have you heard it speak? Has it evinced any true understanding of what has befallen it? No, it lies there like a lump, unknowing. I might as well have my elk upon the slab. Moreover, the Kabalistic text informs me that such beings are of the very lowest orders of Heaven: this is not Gabriel himself, come calling, but the equivalent of some minor imp."

"That still does not entitle you to murder it."

"Kepler. Think of the rewards, man! Think of the *knowledge*."

"But we might be struck dead!"

"What of it?" Tycho said, honestly amazed. "Are we not men of science? Have we not dedicated our lives to astronomy?"

"Our lives, perhaps, but—"

"Consider us, Kepler. You, a mewling weakling from a cursed clan; myself, a noseless drunk with a horde of snotty brats that I can barely feed. You see, I spare no one in my analysis! Our lives are of little consequence compared to the knowledge that lies before us! Anyway," Tycho continued in somewhat less grandiose terms, "we might even survive. We will perform the task tomorrow. The key lies in the angel's breast, so the text tells me, and resembles a pearl."

"And if you extract it, what then?"

"Then, it must be dissolved in extract of vitriol and spread upon a parchment, on which the appropriate calculations will subsequently appear."

"Tycho, this is not science," I said. For a moment, the flames that had consumed my mother's body seemed to dance around the walls of the room and reach toward me. "This is magic."

"There is a point at which science and magic meet," Tycho told me.

"And what point is that?"

"Faith," Tycho replied. "Have faith, little Kepler! Not in this being before you, nor in a God which clearly so despises you that he afflicts you on a daily basis with a variety of anguishes, but in *knowledge*. That is the only pure goal, after all."

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I did not disagree. But I also knew that I was too afraid to do as he asked.

"Tycho—"

"And besides," Tycho went on, and now his voice had grown soft as the paws of a mousing cat, "What do you think might befall you, little Kepler, if you refuse to help me? Astronomy is your only chance of distinguishing yourself, is it not? You could, perhaps, become a clerk and slave away in some hovel somewhere, but that's not what you want, is it?"

He terrified me, but I thought of the angel lying beneath the jar, surely even more helpless than I.

"And without *me*—what?" I heard myself say. "Without me, what hope do you have of comprehending the orbit of Mars? It is too difficult a set of calculations for you; you have hinted as much. You even refuse to show me the whole of your calculations, as if you fear that I am the better astronomer."

Tycho stared at me. For a moment, I thought he was going to strike me, but then he gave a great laugh.

"Some show of spirit, at last! But Kepler, consider this—if I have the secrets of the angel, I do not need *you,* do I?"

"And what of my immortal soul? What of yours?"

"What has God done for you so far, Kepler? Sent your father to hang and your mother to burn. Afflicted your brothers and sisters—not to mention yourself—with a sequence of poxes and plagues that would try the patience of Job. Do you really think God cares about you and your immortal soul?"

I wanted to say *yes,* but the word died before it reached my breath. Tycho must have seen my doubts in my face, for he said, still softly, "I thought as much. Tomorrow, Kepler. Now go to your chamber."

I did so, but I could not sleep. To distract myself, I took up my pen and wrote down this latest episode in the story of the angel. Then I read again all that I have told you so far. It only made me despise myself anew. I set my notes aside in despair, and lay down upon the bed.

At last, shortly before dawn, I fell into a kind of waking dream in which the ceiling of the chamber evaporated to reveal the open heavens. And beyond the fading stars, I thought I glimpsed a vast, unblinking eye. There was no mercy in it, no kindness, and I felt then that it did not matter what I did, I would still be damned.

I sat up, panting against the bolster. In its wake, the knowledge brought a curious sense of freedom. If it did not matter what I did, then—damned or not—I was free to act. I rose from my bed and crept from the chamber.

No one was awake, except for the rats. I could hear the elk snorting in its sleep in the great hall as I ascended the stairs. A thin light filtered through the cracks in the masonry, sufficient to light my passage to the observatory.

The angel lay still beneath the bell jar, but its eyes were open now, and watching me. I took a breath, reached out, plucked the jar away. Then I withdrew the pin from the angel's shoulder: it came free with difficulty, as though I pulled it from a piece of stone, and the hole that it had made closed instantly, bloodless. The angel watched me, still.

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"You are free!" I told it, making flapping motions with my hands. "You must go, *now,* before he finds that you are no longer confined." Now that I had finally taken action, I felt calmer, almost resigned to whatever might follow next. "And then wreak what vengeance you will."

I did not see the angel's lips move, but I heard it speak for the first time.

"Kill me," it said. Its voice was small and musical, remote as a bell far away across the marshes. At first, I thought that I had misheard it.

"What? I have just freed you."

"The astronomer is right," the angel said. "The knowledge lies within me, within all of my kind. But I cannot reach it, any more than you can see your own heart. You have to release it, Johannes Kepler. You have to take the pearl."

"But if it will mean your death—"

"Do you think that God has sanctioned me?" the angel asked. The question caught me off guard; I stared at it. "Do you think I am here by His will?"

"I supposed—"

"The days of faith are passing, Kepler. You have to step from Eden, to sin in order to bring new knowledge to the world. There can be no change in the order of the Church: the sun must always orbit the Earth, unalterable, forever. But knowledge is not a static force; it must move forward, sideways, back. It cannot be contained. I know this as well as you. Where does it say that an angel cannot be a scientist?"

I looked into its eyes and they were no longer dark and opaque, but as blue as the sky. I took the pin and plunged it into the angel's breast. The angel split apart with soundless force, ribs peeling back and crumbling into stone.

There was no pearl within. There was nothing but powder and ash. I stood looking down at it for a long time, until a draft from beneath the door blew the remains away. Then I went slowly back to my chamber.

The consequences of the angel's disappearance were severe. Tycho drank for a week. Even the elk went into hiding. When he sobered up sufficiently, I went to see him. I couldn't face telling him the truth, but he accused me of freeing the angel all the same, roaring at me with furnace anger. This time, I stood my ground.

"The angel must surely have been a test. You cannot cheat the universe," I told him. "There are few quick roads in the landscape of science."

He took a step toward me. I moved swiftly back.

"You are a fool, Kepler," he said.

"Am I? Perhaps so," I replied. "But if I am such, then you can easily do without me.' And I turned and walked away.

"Kepler!"—the bellows followed me out of the chamber, out of the castle and across the bridge that led over the Iser. "Johannes, come back!" But I did not once look behind me.

I returned to Prague, feeling lighter of heart all the same and strangely free from fear of God and man. I had discoursed with an angel, a fellow scientist. Even if it had lied to me, or been mistaken, we had been engaged on the same quest, however briefly, and I found that it meant something.

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I took work as a humble clerk and continued to develop my calculations in the evenings. I proceeded slowly, hampered by constant sickness, but I worked methodically all the same, and one day I looked down at the charts and the diagrams, and discovered that they made sense. It was, curiously, my notes on the orbit of Mars that had precipitated the breakthrough: the very task that Tycho had set me, and at which—I am sure—he hoped I would fail. My conclusions outraged me, being directly contrary to the Copernican system to which I had always adhered, but I could not argue with the mathematics. I twisted and turned, trying to find fault with the calculations, and could not. At last, I laid down my pen.

The Earth traveled about the sun, and I could prove it. No matter what was to befall me, I had proof.

When I looked up, I was not surprised to see the angel hovering before me.

"There was no pearl," I told it.

But the angel only smiled at me, before gliding through the door. I followed it, to find that it had gone, and for a long while I stood outside in the chilly darkness, watching the spring stars wheel above my head. ○

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CURATOR

Charles Stross

Charles Stross lives and writes in Edinburgh, Scotland. His latest novel, *Singularity Sky,* was recently published by Ace. Another book, *The Atrocity Archive,* is due out from Golden Gryphon early next year. In August it will be followed by *The Iron Sunrise* (also from Ace).

Sirhan stands on the edge of an abyss, looking down at a churning orange-and-grey cloudscape far below. The air this close to the edge is chilly and smells slightly of ammonia, although that might be his imagination at work—there's little chance of any gas exchange taking place across the transparent pressure wall of the flying city. He feels as if he could reach out and touch the churning vaporscape. There's no one around, this close to the edge—it's an icy sensation to look out across the roiling depths, at an ocean of gas so cold human flesh would freeze within seconds of exposure, knowing that there's nobody out there for tens of thousands of kilometers. The sense of isolation is aggravated by the paucity of bandwidth, this far out of the system. Most people huddle close to the hub, for comfort and warmth and low latency: posthumans are gregarious.

Beneath Sirhan's feet the lily pad city is extending itself, mumbling and churning in endless self-similar loops like a cubist blastoma growing in the upper atmosphere of Saturn. Great ducts suck in methane and other atmospheric gases, apply energy, polymerize and diamondize and crack off hydrogen to fill the lift cells high above. Beyond the sapphire dome of the city's gas bag, an azure star glares with the speckle of laser light; humanity's first—and last—starship, braking into orbit on the last shredded remnant of its light sail.

He's wondering maliciously how his mother will react to discovering her bankruptcy when the light above him flickers. Something grey and unpleasant splatters against the curve of the nearly invisible wall in front of him, leaving a smear. He takes a step back and looks up angrily. "Fuck you!" He yells. Raucous cooing laughter follows him away from the boundary, feral pigeon voices mocking. "I mean it," he warns, flicking a gesture at the air above his head. Wings scatter in a burst of thunder as a slab of wind solidifies, thistledown-shaped nanomachines suspended on the breeze locking edge-to-edge to form an umbrella over his head. He walks away from the edge, fuming, leaving the pigeons to look for another victim.

Annoyed, Sirhan finds a grassy knoll a couple of hundred meters from the rim and around the curve of the lily pad from the museum build-

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ings—far enough from other humans that he can sit undisturbed with his thoughts, far enough out to see over the edge without being toilet-bombed by flocking flying rats. (The flying city, despite being a product of an advanced technology almost unimaginable two decades ago, is full of bugs—software complexity and scaling laws ensured that the preceding decades of change acted as a kind of cosmological inflationary period for design glitches, and an infestation of passenger pigeons is by no means the most inexplicable problem in this biosphere.)

In an attempt to shut the more unwelcome manifestations of cybernature out, he sits under the shade of an apple tree and marshals his worlds around him. "When is my grandmother arriving?" he asks one of them—speaking into an antique telephone in the world of servants, where everything is obedient and knows its place. The city humors him, for its own reasons.

"She is still containerized, but aerobraking is nearly over; her body will be arriving down-well in less than two megaseconds." The city's avatar in this machinima is a discreet Victorian butler, stony-faced and respectful. No intrusive memory interfaces for Sirhan; for an eighteen-year-old, he's conservative to the point of affectation, favoring verbal commands and anthropomorphic agents over the invisible splicing of virtual neural nets.

"You're certain she's transferred successfully?" Sirhan asks anxiously. He heard a lot about his grandmama when he was young, none of it complimentary. Nevertheless, the old bat must be a lot more flexible than his mother ever gave her credit for, to be subjecting herself to this kind of treatment at her age.

"I'm as certain as I can be, young master, for anyone who insists on sticking to their original phenotype without benefit of offline backup or medical implants. I regret that omniscience is not within my remit. Would you like me to make further specific enquiries?"

"No." Sirhan peers up at the bright flare of laser light, visible even through the soap-bubble membrane that holds in the breathable gas mix, and the trillions of liters of hot hydrogen in the canopy above it. "As long as you're sure she'll arrive before the ship?" Tuning his eyes to ultraviolet, he watches the emission spikes, sees the slow strobing of the low-bandwidth AM modulation that's all the starship can manage by way of down-link communication until it comes within range of the system manifold. It's sending the same tiresomely repetitive question about why it's being redirected to Saturn that it's been putting out for the past week, querying the refusal to supply terawatts of propulsion energy on credit.

"Unless there's a spike in their power beam, you can be certain of that," City replies reassuringly. "And you can be certain your grandmother will revive comfortably."

"One may hope so." To undertake the interplanetary voyage in corporeal person, at her age, without any upgrades or augmentation, must take courage, he decides. "When she wakes up, if I'm not around, ask her for an interview slot on my behalf. For the archives."

"It will be my pleasure." City bobs his head politely.

"That will be all," Sirhan says dismissively, and the window into servantspace closes. Then he looks back up at the pinprick of glaring blue

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laser light near the zenith. *Tough luck, Mom,* he subvocalizes for his journal cache. Most of his attention is forked at present, focused on the rich historical windfall from the depths of the spike that is coming his way, in the form of the thirty-year-old starwhisp's Cartesian theater: but he can still spare some schadenfreude for the family fortunes. *All your assets belong to me, now.* He smiles, inwardly. *I'll just have to make sure they're put to a sensible use this time.*

"I don't see why they're diverting us toward Saturn. It's not as if they can possibly have dismantled Jupiter already, is it?" asks Pierre, rolling the chilled beer bottle thoughtfully between fingers and thumb.

"Why not you ask Amber?" replies the velociraptor squatting beside the log table. (Boris's Ukrainian accent is unimpeded by the dromaeosaurid's larynx; in point of fact it's an affectation, one he could easily fix by sideloading an English pronunciation patch if he wanted to.)

"Well." Pierre shakes his head. "She's spending all her time with that slug, no multiplicity access, privacy ackles locked right down. I could get jealous." His voice doesn't suggest any deep concern.

"What's to get jealous about? Just ask to fork instance to talk to you, make love, show boyfriend good time, whatever."

"Hah!" Pierre chuckles grimly, then drains the last drops from the bottle into his mouth. He throws it away in the direction of a clump of cycads, then snaps his fingers: another one appears in its place.

"Are two megaseconds out from Saturn in any case," Boris points out, then pauses to sharpen his inch-long incisors on one end of the table. Fangs crunch through timber like wet cardboard. "*Grrrrn*. Am seeing most *peculiar* emission spectra from inner solar system. Foggy flying down bottom of gravity well. Am wondering, does ensmartening of dumb matter extend past Jovian orbit now?"

"Hmm." Pierre takes a swig from the bottle and puts it down. "That might explain the diversion. But why haven't they powered up the lasers on the Ring for us? You missed that, too." The huge battery of launch lasers in orbit around Jupiter's innermost moon, which Amber had built on a tottering pile of alien contact derivatives and reputation futures leveraged against her father's agalmic fortune, had powered the light-sail starship *Field Circus* for its first five years, until it arrived in orbit around the brown dwarf Hyundai +4904/-56. Then, for reasons unknown, they'd shut down, leaving it adrift in proximity to the alien artifact known as the Router. Amber and much of her crew—Boris was a conspicuous exception—had uploaded themselves via the Router, only to discover the howling virtual wilderness left behind by the demise of a transcended civilization: a wilderness dominated by feral corporate instruments that used human-equivalent intelligences as fungible currency. Only the stubborn intransigence of Amber's pet robot cat, Aineko, had saved them from a short future as debt collateral. They'd escaped with the help of the Slug—an alien pyramid scheme of bizarre complexity that was on the run from its creditors—and tricked the Router into giving them a return beam.

But it seemed that nobody in the solar system was interested in talking to them now, other than to say "set course for Saturn, following thus-

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and-such orbital elements." It was, Pierre reflected, no more or less perplexing than any of the other incidents they'd weathered.

"Don't know why are not talking." Boris shrugged. "Am telling you from beginning, though, turning entire solar system into computronium is real bad idea, long term. Who knows how far has gone already?"

"Hmm, again." Pierre draws a circle in the air. "Aineko," he calls, "are you listening?"

"Don't bug me." A faint green smile appears in the circle, just the suggestion of fangs and needle-sharp whiskers. "I had an idea I was sleeping furiously."

Boris rolls one turreted eye and drools on the tabletop. "Munch munch," he growls, allowing his saurian body-brain to put in a word.

"What do you need to sleep for? This is a fucking sim, in case you hadn't noticed!"

"I *enjoy* sleeping," replies the cat, irritably lashing its just-now-becoming-visible tail. "What do you want? Fleas?"

"No thanks," Pierre says hastily. Last time he'd called Aineko's bluff, the cat had filled three entire pocket universes with scurrying gray mice: one of the disadvantages of flying aboard a starship the size of a baked bean can full of smart matter was the risk that some of the passengers could get rather too creative with the reality-control system. This cretaceous caffee klatsch was just Boris's entertainment partition; compared to some of the other simulation spaces aboard the *Field Circus,* it was downright conservative. "Look, do you have any updates on what's going on downwell? We're only twenty objective days out from orbital insertion and there's so little to see—"

"They're not sending us power." Aineko materializes fully now, a large orange-and-white tabby cat with a swirl of brown fur in the shape of an @-symbol covering her ribs. For whatever reason, she plants herself on the table tauntingly close to Boris's velociraptor-body's nose. "No propulsion laser means insufficient bandwidth. They're talking in Latin-1 text at 1200 baud, if you care to know." (Which was an insult, given the ship's multi-avabit storage capacity—one avabit is Avogadro's number of bits; about 10^{23} bytes, several billion times the size of the internet in 2001—and outrageous communications bandwidth.) "Amber says, come and see her now. Audience chamber. Informal, of course. I think she wants to discuss it."

"Informal? Am all right without change bodies?"

The cat sniffs. "*I'm* wearing a real fur coat," it declares haughtily, then blinks out a fraction of a second ahead of the snicker-*snack* of bandersnatch-like jaws.

"Come on," says Pierre, standing up. "Let's see what Her Majesty wants with us today."

Welcome to decade seven, third millennium, when the effects of the phase-change in the structure of the solar system is finally becoming visible on a cosmological scale.

There are about eleven billion future-shocked primates in various states of life and undeath throughout the solar system. Most of them cluster where the interpersonal bandwidth is hottest, down in the water

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zone around old Earth. Earth's biosphere has been in the intensive care ward for decades now, weird rashes of hot-burning replicators erupting across it before the world health organization can fix them—grey goo, thylacines, dragons. The last great transglobal trade empire, run from the arcologies of Hong Kong, has collapsed along with capitalism, rendered obsolete by a bunch of superior deterministic resource allocation algorithms collectively known as Economics 2.0. Mercury, Venus, Mars, and Luna are all well on the way to disintegration, mass-pumped into orbit with energy stolen from the haze of free-flying thermoelectrics that cluster so thickly around the solar poles that the sun resembles a fuzzy red ball of wool the size of a young red giant.

Humans are just barely intelligent tool users; Darwinian evolutionary selection stopped when language and tool use converged, leaving the average hairy meme-carrier sadly deficient in smarts. Now the brightly burning beacon of sapience isn't held by humans any more—their cross-infectious enthusiasms have spread to a myriad of other hosts, several of them qualitatively better at thinking. At last count, there were about a thousand non-human intelligent species in Sol space, split evenly between posthumans on one side, naturally self-organizing AI's in the middle, and mammalian nonhumans on the other. The common mammalian neural chassis is easily upgraded to human-style intelligence in most species that can carry a half-kilogram brain, and the descendants of a hundred ethics-challenged doctoral theses are now demanding equal rights. So are the unquiet dead; the panopticon-logged net-ghosts of people who lived recently enough to imprint their identity on the information age, and brought up in the ambitious theological engineering schemes of the Reformed Church of Latter-Day Saints (who want to emulate all possible human beings in real time, so that they can have the opportunity to be saved).

The human memesphere is coming alive, although how long it will remain recognizably human is open to question. The informational density of the inner planets is visibly converging on Avogadro's number of bits per mole, one bit per atom, as the deconstructed dumb matter of the inner planets—except for Earth, preserved for now like a picturesque historic building stranded in an industrial park—is converted into computronium. And it's not just the inner system. The same forces are at work on Jupiter's moons, and those of Saturn, although it'll take thousands of years rather than mere decades to dismantle the gas giants themselves. Even the entire solar energy budget isn't enough to pump Jupiter's enormous mass to orbital velocity in less than centuries. The fast-burning primitive thinkers descended from the African plains apes may have vanished completely or transcended their fleshy architecture before the solar Matrioshka brain is finished.

In the meantime, there's a party brewing down in Saturn's well.

Sirhan's lily pad city floats inside a gigantic and nearly invisible sphere in Saturn's upper atmosphere; a balloon kilometers across with a shell of fullerene-reinforced diamond below and a hot hydrogen gas bag above. It's one of several hundred multi-megaton soap-bubbles floating in the sea of turbulent hydrogen and helium that is the upper atmosphere of

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Saturn, seeded there by the Society for Creative Terraforming, subcontractors for the 2074 Worlds Fair.

The cities are elegant, grown from a conceptual seed a few megawords long. Their replication rate is slow—it takes months to build a bubble—but in only a couple of decades exponential growth will have paved the stratosphere with human-friendly terrain. Of course, the growth rate will slow toward the end, as it takes longer to fractionate the metal isotopes out of the gas giant's turbid depths, but before that happens, the first fruits of the robot factories on Ganymede will be pouring hydrocarbons down into the mix. Eventually Saturn—surface gravity a human-friendly eleven meters per second squared—will have a planet-wide biosphere with nearly a hundred times the surface area of Earth. And a bloody good thing indeed this will be, because otherwise Saturn's no use to anyone except as a fusion fuel bunker for the deep future.

This particular lily pad is carpeted in grass, the hub of the disk rising in a gentle hill surmounted by the glowering concrete hump of the Boston Museum of Science. It looks curiously naked, shorn of its backdrop of highways and the bridges of the Charles River—but even the generous kiloton dumb-matter load-outs of the skyhooks that lifted it into orbit wouldn't have stretched to bringing its framing context along. Probably someone will eventually knock up a cheap diorama backdrop out of utility fog, Sirhan thinks, but for now, the museum stands proud and isolated, a solitary redoubt of dumb matter in exile from the fast-thinking core of the solar system.

"Waste of money," grumbles the woman in black. "Whose stupid idea was this, anyway?" She jabs the diamond ferrule of her cane at the museum.

"It's a statement," Sirhan says absently. "You know: we've got so many newtons we can send our cultural embassies anywhere we like. The Louvre is on its way to Pluto, did you hear that?"

"Waste of energy." She lowers her cane reluctantly and leans on it. Pulls a face: "It's not *right*."

"You grew up during the second oil crunch, didn't you?" Sirhan prods. "What was it like then?"

"What was it. . . ? Oh, gas hit fifty bucks a gallon, but we still had plenty for bombers," she says dismissively. "We knew it would be okay. If it hadn't been for those damn' meddlesome post-humanists—" Her wrinkled, unnaturally aged face scowls at him furiously from underneath hair that has faded to the color of rotten straw. "Like your grandfather, damn him. If I was young again, I'd go and piss on his grave to show him what I think of what he did. If he *has* a grave."

Memo checkpoint: log family history, Sirhan reminds a distinct part of himself. As a dedicated historian, he records every experience routinely, both before it enters his narrative of consciousness—efferent signals are the cleanest—and also his own stream of selfhood, against some future paucity of memory. But his grandmother has been remarkably consistent over the decades in her refusal to adopt the new modalities.

"You're recording this, aren't you?" she sniffs.

"I'm not recording it, grandmama," he says gently, "I'm just preserving my memories for future generations."

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"Hah. We'll see," she says suspiciously. Then she surprises him with a bark of laughter, cut off abruptly: "No, *you'll* see, darling. I won't be around to be disappointed."

"Are you going to tell me about my grandfather?" asks Sirhan.

"No. I know you posthumans, you'll just go and ask his ghost yourself. Don't try to deny it! There are two sides to every story, child, and he's had more than his fair share of ears, the scumbag. Leaving me to bring up your mother on my own, and nothing but a bunch of worthless intellectual property and a dozen lawsuits from the mafia to do it with. He's worthless trash, and don't you forget it. Lazy idiot couldn't even form just one start-up on his own: he had to give it all away, all the fruits of his genius."

While she rambles on, occasionally punctuating her characterization with sharp jabs of the cane, Pamela leads Sirhan on a slow, wavering stroll that veers around one side of the museum, until they're standing next to a starkly engineered antique loading bay. "Should have tried *real* communism instead," she harrumphs: "put some steel into him, shake those starry-eyed visionary positive-sum daydreams loose. You knew where you *were* in the old times, and no mistake. Humans were real humans, work was real work. And then, when *she* went to the bad, that was all his fault too, you know."

"She? You mean my, ah, mother?" Sirhan diverts his primary sensorium back to Pamela's vengeful muttering. There are aspects to this story that he isn't completely familiar with, angles he needs to sketch-in so that he can satisfy himself that all is as it should be when the bailiffs go in to repossess Amber's mind—

"He sent her his cat! Of all the mean-spirited, low, downright dishonest things he ever did, *that* was the worst part of it. That cat was *mine,* but he reprogrammed it to lead her astray. And it succeeded. She was only twelve at the time, an impressionable age, I'm sure you'd agree. I was trying to raise her right. Children need moral absolutes, especially in a changing world, even if they don't like it much at the time. But Manfred never really understood childhood, mostly on account of him never growing up."

"I haven't heard much about the cat," Sirhan says quietly. A glance at the loading bay doors tells him that they've been serviced recently; a thin patina of expended foglets have formed a snowy scab around their edges, flaking off like blue refractive candyfloss that leaves bright metal behind. "Didn't it go missing or something?"

Pamela snorts. "When your mother ran away, it uploaded itself into her starwhisp and deleted its body. It was the only one of them that had the guts to do that—or maybe it was afraid I'd have it subpoena'd as a hostile witness. Or, and I can't rule this out, your grandfather gave it a suicide reflex. He was quite evil enough to do something like that."

"So when my mother sent her ghost away to avoid bankruptcy, the cat . . . didn't stay behind? Not at all? How remarkable." Sirhan doesn't bother adding *how suicidal.* Any artificial entity that's willing to upload its neural state vector into a one-kilogram interstellar probe and fire itself at an alien beacon three quarters of the way to Alpha Centauri with no backup and no clear way of returning home has got to be more than a few methods short in the object factory.

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"It's a vengeful beast." Pamela pokes her stick at the ground sharply, mutters a command word, and lets go of it. She stands before Sirhan, craning her neck back to look up at him. "My, what a tall boy you are."

"Person," he corrects, instinctively. "I'm sorry, I shouldn't presume."

"Person, thing, boy, *whatever*—you're engendered, aren't you?" she asks, sharply, waiting until he nods reluctantly. "Never trust anyone who can't make up their mind whether to be a man or a woman," she says gloomily. "You can't rely on them." Sirhan, who has placed his reproductive system on hold until he needs it, holds his tongue. "That damn cat," his grandmother complains. "*It* carried your grandfather's business plan to my daughter and spirited her away into the big black. *It* poisoned her against me. *It* encouraged her to join in that frenzy of speculative bubble-building that caused the market reboot that brought down the Ring Imperium. And now *it*—"

"Is *it* on the ship?" Sirhan asks, almost too eagerly.

"It might be." She stares at him through narrowed eyes. "You want to interview it, huh?"

Sirhan doesn't bother denying it. "I'm a historian, grandmama. And that probe has been somewhere no other human sensorium has seen. It may be old news, and there may be old lawsuits waiting to feed on the occupants, but . . ." he shrugs. "Business is business, and *my* business is ruins."

"Hah." She stares at him for a moment, then nods, very slowly. She leans forward to rest both wrinkled hands atop her cane, joints like bags of shriveled walnuts: her suit's endoskeleton creaks as it adjusts to accommodate her confidential posture. "You'll get yours, kid." The wrinkles twist into a frightening smile, sixty years of saved-up venom finally within spitting distance of a victim. "And I'll get what *I* want, too. Between us, your mother won't know what's hit her!"

"Relax. Between us, your mother won't know what's hit her," says the cat, baring needle-teeth at the queen in the big chair—carved out of a single lump of computational diamond, her fingers clenched whitely on the sapphire-plated arms—her minions, lovers, friends, crew, shareholders, bloggers, and general factional auxiliaries spaced out around her. And the slug. "It's just another lawsuit. You can deal with it."

"Fuck 'em if they can't take a joke," Amber says, a trifle moodily. Although she's ruler of this embedded space, with total control over the reality model underlying it, she's allowed herself to age to a dignified twenty-something: dressed casually in gray sweats, she doesn't look like the once-mighty ruler of a Jovian moon, or, for that matter, like the renegade bankrupt commander of an interstellar expedition. "Okay, I think you'd better run that past me again. Unless anyone's got any suggestions?"

"If you will excuse me?" It's Doctor Khurasani, the ship's theologian and general eschatological attorney—short, dapper, perpetually worried-looking beneath his beard. "We have a shortage of insight here. I believe two laws were cited as absolute system-wide conventions—and how they convinced the ulema to go along with *that* I would very much like to know—concerning the rights and responsibilities of the undead. Which, apparently, we are. Did they by any chance attach the code to their claim?"

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"Do bears shit in woods?" asks Boris, raptor-irascible, with an angry clatter of teeth. "Is full dependency graph and parse-tree of criminal code crawling way up carrier's ass as we speak. Am drowning in lawyer gibberish! If you—"

"Boris. Can it." Amber snaps. Tempers are high in the futuristic throne room mapped out of her one-time receiving suite in the Ring Imperium. It started as a childhood jape turned mediaevalist exponential construction, then grew into a vast orbiting litigation and launch center on the back of the reputations-fortune Amber inherited from her father—now it's gone, snapped out of existence like a stock-market bubble, light-lagged by relativistic flight and the accelerating pace of change. She didn't know what to expect when she arrived home from the expedition to the Router, but bankruptcy proceedings weren't part of it. Nor was being declared liable for debts run up by a renegade splinter of herself, her own un-uploaded identity that had stayed home to face the music, aged in the flesh, married, gone bankrupt, died—*incurred child support payments?* "I don't hold you responsible for this," she added through gritted teeth, with a significant glace toward Sadeq.

"This is truly a mess fit for the prophet himself, peace be unto him, to serve judgment upon." Doctor Khurasani, Sadeq, looks as shaken as she is by the implications the lawsuit raises. His gaze skitters around the room, looking anywhere but at Amber—and Pierre, her lanky toy-boy astrogator and bedwarmer—as he laces his fingers.

"Drop it. I said I *don't* blame you." Amber forces a smile. "We're all tense from being locked in here with no bandwidth. Anyway, I smell mother-dearest's hand underneath all this litigation. Sniff the glove. We'll sort a way out."

"We could keep going." This from Ang, at the back of the room. Diffident and shy, she doesn't generally open her mouth without a good reason. "The *Field Circus* is in good condition, isn't it? We could divert back to the beam from the Router, accelerate up to cruise speed, and look for somewhere else to live. There must be a few suitable brown dwarves within a hundred light years. . . ."

"We've lost too much sail-mass," says Pierre. He's not meeting Amber's eyes. There are lots of subtexts loose in this room, broken narratives from stories of misguided affections. Amber pretends not to notice his embarrassment. "We ejected half our original launch sail to provide the braking mirror at Hyundai +4904/-56, and almost eight megaseconds ago we halved our area again to give us a final deceleration beam for Saturn orbit. If we did it again we wouldn't have enough area left to repeat the trick and still decelerate at our final target." Laser-boosted light sails do it with mirrors; after boost, they can drop half the sail and use it to reverse the launch beam and direct it back at the ship, to provide deceleration. But you can only do it a few times before you run out of sail. "There's nowhere to run."

"Nowhere to—" Amber stares at him through narrowed eyes. "Sometimes I really wonder about you, you know?"

"I know you do." And Pierre really *does* know, because he carries a little homunculoid around in his society of mind, a model of Amber far more ac-

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curate and detailed than any pre-upload human could possibly have managed to construct of their lover. (For her part, Amber keeps a little Pierre doll tucked away inside the creepy cobwebs of her head, part of an exchange of insights they took part in years ago. But she doesn't try to fit inside his head too often any more—it's not good to be able to second-guess your lover every time.) "I also know that you're going to rush in and grab the bull by the, ah, no. Wrong metaphor. This is your mother we are discussing?"

"My *mother*." Amber nods thoughtfully. "Where's Donna?"

"I don't—"

There's a throaty roar from the back and Boris lurches forward with something in his mouth, an angry Bolex that flails his snout with its tripod legs. "Hiding in corners again?" Amber says disdainfully.

"I am a camera!" protests the camera, aggrieved and self-conscious as it picks itself up off the floor. "I am—"

Pierre leans close, sticks his face up against the fisheye lens. "You're fucking well going to be a human being just this once. *Merde!*"

The camera is replaced by a very annoyed blonde woman wearing a safari suit and more light meters, lenses, camera bags, and microphones than a CNN outside-broadcast unit. "Go fuck yourself!"

"I don't like being spied on," Amber says sharply. "Especially as you weren't invited to this meeting. Right?"

"I'm the archivist." Donna looks away, stubbornly refusing to admit anything. "*You* said I should—"

"Yes, *well*." Amber is embarrassed. But it's a bad idea to embarrass the queen in her audience chamber. "You heard what we were discussing. What do *you* know about my mother's state of mind?"

"Absolutely nothing," Donna says promptly. She's clearly in a sulk and prepared to do no more than the minimum to help resolve the situation. "I only met her once. You look like her when you are angry, do you know that?"

"I—" For once, Amber's speechless.

"—I'll schedule you for facial surgery," offers the cat. *Sotto voce:* "It's the only way to be sure."

Normally, accusing Amber of any resemblance to her mother, however slight and passing, would be enough to trigger a realityquake within the upload environment that passes for the bridge of the *Field Circus*. It's a sign of how disturbed by the lawsuit Amber is that she lets the cat's impertinence slide. "What is the lawsuit, anyway?" Donna asks, nosy as ever and twice as annoying: "I didn't see that bit."

"It's horrible," Amber says vehemently.

"Truly evil," echoes Pierre.

"Fascinating but wrong," Sadeq muses thoughtfully.

"Horrible, all the same!"

"Yes, but what *is* it?" Donna the all-seeing-eye archivist and camera manqué asks.

"It's a demand for settlement." Amber takes a deep breath. "Damn it, you might as well tell everyone—it won't stay secret for long." She sighs. "After we left, it seems my other half—my original incarnation, that is—

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got married. To Sadeq, here." She nods at the Iranian theologian, who looks just as bemused as she did, the first time she heard this part of the story. "And they had a child. Then the Ring Imperium went bankrupt. The child is demanding maintenance payments, backdated nearly twenty years, from *me,* on the grounds that the undead are jointly and severally liable for debts run up by their incarnations; it's a legal precedent established to prevent people from committing suicide temporarily as a way to avoid bankruptcy. Worse, the lien on my assets is measured in subjective time from a point at the Ring Imperium about nineteen months after our launch time—we've been in relativistic flight, so while my other half would be out from under it by now if she'd survived, I'm still subject to the payment order. But compound interest applies back home—*that* is to stop people trying to use the twins' paradox as a way to escape liability. So, by being away for about twenty-eight years of wall-clock time, I've run up a debt I didn't know about to enormous levels.

"This man, this son I've never met, theoretically owns the *Field Circus* several times over. And my accounts are wiped out—I don't even have enough money to download us into fleshbodies. Unless one of you guys has got a secret stash that survived the market crash after we left, we're all in deep trouble."

A mahogany dining table eight meters long graces the flagstoned floor of the huge museum gallery, beneath the skeleton of an enormous Argentinosaurus and a suspended antique Mercury capsule more than a century old. The dining table is illuminated by candlelight, silver cutlery and fine porcelain plates setting out two places at opposite ends. Sirhan sits in a high-backed chair beneath the shadow of a triceratops' rib cage. Opposite him, Pamela has dressed for dinner in the fashion of her youth. She raises her wine glass toward him. "Tell me about your childhood, why don't you?" she asks. High above them, Saturn's rings shimmer through the skylights, like a luminous paintsplash thrown across the midnight sky.

Sirhan has misgivings about opening up to her, but consoles himself with the fact that she's clearly in no position to use anything he tells her against him. "Which childhood would you like to know about?" he asks.

"What do you mean, *which?*" Her face creases up in a frown, perplexed.

"I had several. Mother kept hitting the reset switch, hoping I'd turn out better." It's his turn to frown.

"She did, did she," breathes Pamela, clearly noting it down to hold as ammunition against her errant daughter. "Why do you think she did that?"

"It was the only way she knew to raise a child," Sirhan says defensively. "She didn't have any siblings." *When* I *have children, there will be more than one*, he tells himself smugly: when, that is, he has adequate means to find himself a bride, and adequate emotional maturity to activate his organs of procreation. A creature of caution, Sirhan is not planning to repeat the errors of his ancestors on the maternal side.

Pamela flinches: "It's not *my* fault," she says quietly. "Her father had quite a bit to do with that. But what—what different childhoods did you have?"

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"Oh, a fair number. There was the default option, with mother and father arguing constantly—she refused to take the veil and he was too stiff-necked to admit he was little more than a kept man, and between them they were like two neutron stars locked in an unstable death-spiral of gravity. Then there were my other lives, forked and reintegrated, running in parallel. I was a young goat-herd in the days of the middle kingdom in Egypt, I remember that; and I was an all-American kid growing up in Iowa in the 1950s, and another me got to live through the return of the hidden imam—at least, his parents thought it was the hidden imam—and—" Sirhan shrugged. "Perhaps that's where I acquired my taste for history."

"Did your parents ever consider making you a little girl?" asks his grandmother.

"Mother suggested it a couple of times, but father forbade it." *Or rather, decided it was unlawful,* he recalls. "I had a very conservative upbringing."

"I wouldn't say that. When I was a little girl, that was all there was to be; none of these questions of self-selected identity. Didn't you ever have a problem knowing who you were?"

The entrees arrive, diced melon on a silver salver, and Sirhan waits patiently for his grandmama to chivvy the table into serving her. "The more people you are, the more you know who *you* are." Sirhan shrugs. "You learn what it's like to be other people. Father thought that perhaps it isn't good for a man to know too much about what it's like to be a woman." *And grandfather disagrees, but you already know that,* he adds for his own stream of consciousness.

"I couldn't agree more." Pamela smiles at him, an expression that might be that of a patronizing elder aunt if it wasn't for her alarming sharkishness—or is it playfulness? Sirhan covers his confusion by spooning chunks of melon into his mouth, forking temporary ghosts to peruse dusty etiquette manuals and warn him if he's about to commit some faux pas. "So, how did you enjoy your childhoods?"

"Enjoy isn't a word I would use," he replies, laying down his spoon. *As if childhood is something that ever ends.* Sirhan is considerably less than a gigasecond old, and confidently expects to exist for at least a terasecond—if not in exactly this molecular configuration, then at least in some physical incarnation. And he has every intention of staying young for that entire vast span—even into the endless petaseconds that might follow, although by then, megayears hence, he speculates that issues of neoteny will no longer interest him. "It's not over yet. How about you? Are you enjoying your old age, grandmama?"

Pamela almost flinches, but keeps iron control of her expression; the flush of blood in the capillaries of her cheeks, visible to Sirhan through the tiny infrared eyes he keeps afloat in the air above the table, gives her away. "I'm enjoying it fine," she says lightly.

"It's your revenge, isn't it?" Sirhan asks, smiling and nodding as the table removes the entrees.

"Why, you little—" She stares at him rather than continuing. A very bleak stare it is, too. "What would you know about revenge?" she asks.

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"I'm the family historian." Sirhan smiles humorlessly. "I lived from two to seventeen years several hundred times over before my eighteenth birthday. It was that reset switch, you know. I don't think mother realized that my primary stream of consciousness was journaling everything."

"That's monstrous." Pamela picks up her wine glass and takes a sip to cover her confusion. Sirhan has no such retreat—grape juice in a tumbler, unfermented, wets his tongue. "I'd *never* do something like that to any child of mine."

"So why won't you tell me about your childhood?" asks her grandson. "For the family history, of course."

"I'll—" she puts her glass down. "You intend to write one," she states.

"I'm thinking about it." Sirhan sits up. "An old-fashioned book covering three generations, living through interesting times," he suggests. "A work of postmodern history, the incoherent school at that—how do you document people who fork their identities at random, spend years dead before reappearing on the stage, and have arguments with their own relativistically preserved other copy? I could trace the history further, of course—if you tell me about *your* parents, although I am certain they aren't around to answer questions directly—but we reach the boring dumb-matter slope back to the primeval soup surprisingly fast if we go there, don't we? With so much of human history occupying the untapped future, we historians have our work cut out recording the cursor of the present as it logs events. So I might as well start at home."

"You're set on immortalism." Pamela studies his face.

"Yes," he says idly. "Frankly, I can understand you wanting to grow old out of a desire for revenge—but pardon me for saying this, I have difficulty grasping your willingness to follow through with the procedure! Isn't it awfully painful?"

"Growing old is *natural,*" growls the old woman. "When you've lived long enough for all your ambitions to be in ruins, friendships broken, lovers forgotten or divorced acrimoniously, what's left to go on for? You feel tired and old in spirit, you might as well be tired and old in body! Anyway, wanting to live forever is immoral. Think of all the resources you're taking up that younger people need! Even uploads face a finite data-storage limit after a time. It's a monstrously egotistical statement, to say you intend to live forever. And if there's one thing I believe in, it's public service—duty—the obligation to make way for the new. Duty and control."

Sirhan absorbs all this, nodding slowly to himself as the table serves up the main course—honey-glazed roast long pork with sautéed potatoes au gratin and carrots Debussy—when there's a loud *bump* from overhead.

"What's that?" Pamela asks querulously.

"One moment." Sirhan's vision splits into a hazy kaleidoscope view of the museum hall as he forks ghosts to monitor each of the ubiquitous cameras. He frowns; something is moving on the balcony, between the Mercury capsule and a display of antique random-dot stereoisograms. "Oh dear. Something seems to be loose in the museum."

"Loose? What do you mean, loose?" An inhuman shriek splits the air above the table, followed by a crash from upstairs. Pamela stands up unsteadily, wiping her lips with her napkin: "Is it safe?"

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"No, it isn't safe." Sirhan glowers. "It's disturbing my meal!" He looks up, in person. A flash of orange fur shows over the balcony, then the Mercury capsule wobbles violently on the end of its guy-wires. Two arms and a bundle of rubbery *something* covered in umber hair lurches out from the handrail and casually grabs hold of the priceless historical relic, then clambers inside and squats on top of the dummy wearing Alan Shepard's age-crackled space suit. "It's an *ape!* City, I say, city! What's a monkey doing loose in my dinner party?"

"I am most deeply sorry, sir, but I don't know. Would sir care to identify the monkey in question?" replies the city, which for reasons of privacy has manifested itself as a bodiless voice.

There's a note of humor in it that Sirhan takes deep exception to. "What do you mean? Can't you *see* it?" he demands, focusing in on the errant primate, which is holed up in the Mercury capsule dangling from the ceiling, smacking its lips, rolling its eyes, and fingering the gasket around the capsule's open hatch. It hoots quietly to itself, then leans out of the open door and moons over the table, baring its buttocks. "Get back!" Sirhan calls to his grandmother, then he gestures at the air above the table, intending to tell the utility fog to congeal. Too late. The ape farts thunderously, then lets rip a stream of excrement across the dining table. Pamela's face is a picture of wrinkled disgust as she holds her napkin in front of her nose. "Damnit, solidify, will you!" Sirhan curses, but the ubiquitous misty pollen-grain sized robots refuse to respond.

"What's your problem? Invisible monkeys?" asks the city.

"Invisible—" he stops.

"Can't you see what it did?" Pamela demands, backing him up. "It just defecated all over the main course!"

"I see nothing," City says uncertainly.

"Here, let me help you." Sirhan lends it one of his eyes, rolls it to focus on the ape, which is now reaching lazy arms around the hatch and patting the roof of the capsule down, as if hunting for the wire's attachment points.

"Oh dear," says the city, "I've been hacked. That's not supposed to be possible."

"Well it fucking *is,*" hisses Pamela.

"Hacked?" Sirhan stops trying to tell the air what to do and focuses on his clothing instead. Fabric re-weaves itself instantly, mapping itself into an armored airtight suit that raises a bubble visor from behind his neck and flips shut across his face. "City. Please supply my grandmama with an environment suit *now*. Make it completely autonomous."

The air around Pamela begins to congeal in a blossom of crystalline security, as a sphere like a giant hamster ball precipitates out around her. "If you've been hacked, the first question is, who did it?" Sirhan states. "The second is 'why?' and the third is 'how?' " He edgily runs a self-test, but there's no sign of inconsistencies in his own identity matrix, and he has hot shadows sleeping lightly at scattered nodes across half a dozen light hours: unlike pre-post-human Pamela, he's immune to murder-simple. "If this is just a prank—"

Seconds have passed since the orangutan got loose in the museum, further seconds since City realized its bitter circumstance. Seconds are long

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enough for huge waves of countermeasures to sweep the surface of the lily pad habitat. Invisibly small utility foglets are expanding and polymerizing into defenses throughout the air, trapping the thousands of itinerant passenger pigeons in mid-flight and locking down every building and every person who walks the paths outside. City is self-testing its trusted computing base, starting with the most primitive secured kernel and working outward. Meanwhile Sirhan, with blood in his eye, heads for the staircase with the vague goal of physically attacking the intruder: Pamela is retreating at a fast roll, tumbling toward the safety of the mezzanine floor and a garden of fossils. "Who do you think you are, barging in and shitting on my supper?" Sirhan yells as he bounds up the stairs. "I want an explanation! Right now!"

The orangutan finds the nearest cable and gives it a yank, setting the one-ton capsule swinging. It bares its teeth at Sirhan in a grin. "Remember me?" it asks, in a sibilant French accent.

"Remember—" Sirhan stops dead. "Tante Annette? *What* are you doing in that orangutan?"

"Having autonomic control problems." The ape grimaces wider, then bends one arm sinuously and scratches at its armpit. "I am sorry. I was only meaning to say hello and to pass on a message."

"What message?" Sirhan demands. "You've upset my grandmama, and if she finds out you're here—"

"I'll be gone." The ape—Annette—sits up. "Your grandfather salutes you and says he will be visiting shortly. In the person, that is. He is very keen to meet your mother and her passengers. That was all! Have you a message for him?"

"Isn't he dead?" Sirhan asks, dazed.

"No more than I am. Good-day!" The ape swings hand-over-hand out of the capsule, then lets go and plummets ten meters to the hard stone floor below. Its skull makes a noise like a hard-boiled egg impacting concrete.

"Shit," breathes Sirhan. "City!" He snaps.

"Yes, oh master?"

"Remove that body," he says, pointing over the balcony. "I'll trouble you not to disturb my grandmother with any details. In particular, don't tell her it was Annette. The news may upset her." *The perils of having a long-lived post-human family,* he thinks: *too many mad aunts.* "If you can find a way to stop Tante 'nette from growing any more apes, that might be a good idea." A thought strikes him. "By the way, do you know when my grandfather is due to arrive?"

"Your grandfather?" asks City. "Isn't he dead?"

Sirhan looks over the balcony, at the blood-seeping corpse of the intruder. "Not according to his second wife's last incarnation."

Funding the family reunion isn't going to be a problem, as Amber discovers when she receives an offer of incarnation good for all the passengers and crew of the *Field Circus*.

She isn't sure quite where the money is coming from; presumably, it's some creaky financial engine designed by Dad, stirring from its bear-proofed bunker for the first time in decades to suck dusty syndication

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feeds and liquidate long-term assets held against her return. She's duly grateful—indeed, fervently so—for the details of her own impecunious position grow more depressing the further she delves into them. Her sole asset is the *Field Circus*, a thirty-years obsolete starwhisp massing less than twenty kilograms, and its cargo of uploaded passengers and crew. Without the far-sighted trust fund that has suddenly chugged into life, she'd be stranded in the realm of ever-circling leptons. But now the fund has sent her its invitation to incarnation, she's got a dilemma. Because one of the *Field Circus*'s passengers has never actually *had* a meatspace body. . . .

Amber finds the slug browsing quietly in a transparent space filled with lazily waving branches that resemble violet coral fans. They're not; they're a ghost-memory of alien life, an order of thermophilic quasi-fungi with hyphae ridged in actin/myosin analogs, muscular and slippery filter-feeders that eat airborne unicellular organisms. The slug itself is about two meters long and has a lacy white exoskeleton of curves and arcs that don't repeat, disturbingly similar to a Penrose tiling; chocolate-brown organs pulse slowly under the skeleton. The ground underfoot is dry but feels swampy.

Actually, the slug is a surgical disguise. Both it and the quasi-fungal ecosystem have been extinct for millions of years, existing only as cheap stage props in an interstellar medicine show run by rogue financial instruments. The slug itself is one such self-aware scam, probably a pyramid scheme or even an entire compressed junk-bond market in heavy recession, trying to hide from its creditors by masquerading as a life form. But there's a problem with incarnating it down in Sirhan's habitat—the ecosystem it evolved for is a cool Venusiform, thirty atmospheres of saturated steam baked under a sky the color of hot lead streaked with yellow sulfuric acid clouds. The ground is mushy because it's melting, not because it's damp.

"You're going to have to pick another somatotype," Amber explains, laboriously rolling her interface around the red-hot coral reef like a giant soap bubble—it's transparent and infinitely thin, a discontinuity in the physics model of the simulation space, mapping signals between the human-friendly environment on one side and the crushing, roasting hell on the other. "This one is simply not compatible with any of the supported environments where we're going."

"I am not understanding. Surely I can integrate with the available worlds of our destination?"

"Uh, things don't work that way outside cyberspace." Suddenly, Amber is at a bit of a loss. "The physics model *could* be supported, but the energy input to do so would be prohibitive and you would not be able to interact as easily with other physics models as we can now." She forks a ghost, demonstrates a transient other-Amber in a refrigerated tank rolling across the Slug's backyard, crushing coral and hissing noisily. "You'd be like this."

"Your reality is badly constructed, then," the Slug points out.

"It's not constructed at all, it just *evolved,* randomly." Amber shrugs. "We can't exercise the same level of control over the underlying embed-

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ded context that we can over this one; I can't simply magic you an interface that will let you bathe in steam at three hundred degrees."

"Why not?" asks the Slug. Translation wetware adds a nasty, sharp rising whine to the question, turning it into a demand.

"It's a privilege violation," Amber tries to explain. "The reality we're about to enter is, uh, provably consistent. It has to be, because it's consistent and stable, and if we could create new local domains with different rules, they might propagate uncontrollably. It's not a good idea, believe me. Do you want to come with us or not?"

"I have no alternative," the Slug says, slightly sulkily. "But do you have a body I can use?"

"I think—" Amber stops, suddenly. She snaps her fingers. "Hey, cat!"

A Cheshire grin ripples into view, masked into the domain wall between the two embedded realities. "Hey, human."

"Whoa!" Amber takes a backward step from the apparition. "Our friend here's got a problem, no suitable downloadable body. We meat puppets are all too closely tied to our neuronal ultrastructure, but you've got a shitload of programmable neural arrays. Can we borrow some?"

"You can do better than that." Aineko yawns, gathering substance by the moment. The Slug is rearing up and backing away like an alarmed sausage: whatever it perceives in the membrane seems to frighten it. "I've been designing myself a new body. Your corporate scam artist here can have my old template. How's that?"

"Did you hear that?" Amber asks the Slug. "Aineko is kindly offering to donate her body to you. Will that do?" Without waiting, she winks at her cat and taps her heels together, fading out with a whisper and a smile: "See you on the other side. . . ."

It takes several minutes for the *Field Circus*'s antique transceiver to download the dozens of avabits occupied by the frozen-state vectors of each of the people running in its simulation engines. Tucked away with most of them is a resource bundle consisting of their entire sequenced genome, a bunch of phenotypic and proteome hint markers, and a wishlist of upgrades. Between the gene maps and the hints, there's enough data to extrapolate a meat machine. So the festival city's body shop goes to work turning out hacked stem cells and fabbing up incubators.

It doesn't take long to reincarnate a starship-full of relativity-lagged humans. First, City carves out skeletons for them—politely ignoring a crudely phrased request to desist from Pamela, on the grounds that she has no power of attorney—then squirts osteoclasts into the spongy ersatz bone. They look like ordinary human stem cells at a distance, but they don't have nuclei; just primitive pinpricks of computronium, blobs of smart matter so small they're as dumb as an ancient Pentium, reading a control tape that is nevertheless better structured than anything mother nature evolved. These heavily optimized fake stem cells—biological robots in all but name—spawn like cancer, spitting out short-lived anucleated secondary cells. Then City infuses each mess of quasi-cancerous tissue with a metric shitload of carrier capsids, which deliver the *real* cellular control mechanisms to their target bodies. Within a megasecond,

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the almost random churning of the construction bots gives way to a more controlled process as nanoscale CPUs are replaced by ordinary nuclei and eject themselves from their host cells, bailing out via the half-formed renal system —except for those in the central nervous system, which have a final job to do. Eleven days after the invitation, the first passengers are being edited into the pattern of synaptic junctions inside the newly minted skulls.

(This whole process is tediously slow and laughably obsolescent technology by the standards of the fast-moving core. Down there, they'd just set up a wake shield in orbit, chill it down to a fractional kelvin, whack two coherent matter beams together, teleport some state information into place, and yank the suddenly materialized meatbody in through an airlock before it has time to asphyxiate. But then again, down in the hot space, they don't have much room for flesh any more. . . .)

Sirhan doesn't pay much attention to the pseudo-cancers fermenting and churning in the row of tanks that lines the Gallery of the Human Body in the Bush wing of the museum. Newly formed, slowly unskeletonizing corpses—like a time-lapse process of decay with a finger angrily twisting the dial into high-speed reverse—are distasteful and not aesthetically pleasing to watch; nor do the bodies tell him anything about their occupants. This sort of stuff is just a necessary prequel to the main event, a formal reception and banquet to which he has devoted the full-time attention of four ghosts.

He could, given a few less inhibitions, go dumpster-diving in their mental archives, but that's one of the big taboos of the post-wetware age. (Spooky institutions went meme-profiling and memory-mining in the third and fourth decades, gained a thought-police rap sheet and spawned a backlash of deviant mental architectures resilient to infowar intrusions. Now the nations that those spook institutions served no longer exist, their very land masses being part of the orbiting noospheric construction project that will ultimately turn the entire solar system into a gigantic Matrioshka brain.)

Instead, he spends most of his waking fleshbody hours with Pamela, asking her questions from time to time and mapping the splenetic overspill of her memories into his burgeoning family-knowledge base.

"I wasn't always this cynical," Pamela explains, waving her cane in the vague direction of the cloudscape beyond the edge of the world and fixing Sirhan with a beady stare. (He's brought her out here hoping that it will trigger another cascade of memories, sunsets on honeymoon island resorts and the like, but all that seems to be coming up is bile.) "It was the successive betrayals. Manfred was the first, and the worst in some ways, but that little cow Amber hurt me more, if anything. If you ever have children, be careful to hold something back for yourself: because if you don't, when they throw it all in your face, you'll feel like dying."

"Is dying inevitable?" asks Sirhan, knowing damn well that it isn't, but more than happy to give her an excuse to pick at her scabbed-over love wound: this is *great* history, and he's having the time of his flinty-hearted life leading her up to the threshold of the family reunion he's hosting.

"Sometimes I think it is," his grandmother replies bleakly. "Humans

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don't live in a vacuum; we're part of a larger pattern of life." She stares out across the troposphere of Saturn, where a thin rime of blown methane snow catches the distant sunrise in a ruby-tinted fog. "The old gives way to the new," she sighs, and tugs at her cuffs. (Ever since the incident with the gatecrashing ape, she's taken to wearing an antique formal pressure suit, all clinging black spider-silk woven with flexible pipes and silvery smart sensor nets.) "There's a time to get out of the way of the new, and I think I passed it some ways back."

"Um," says Sirhan, who is somewhat surprised by this new angle in her lengthy, self-justifying confession. "But what if you're just saying this because you *feel* old? If it's just a physiological malfunction, we could fix it and then you'd—"

"*No*. Life prolongation is *wrong,* Sirhan. It's immoral; blocks up the natural order, keeps us old cobweb stands hanging around and getting in you young things' way. And then there are the theological questions. If you try to live forever, you never get to meet your maker."

"Your maker? Are you a theist, then?"

"I—think so." Pamela is silent for a minute. "Although there are so many different approaches to the subject that it's hard to know which version to believe. For a long time, I was secretly afraid that your father might actually have had the answers. That I might have been wrong all along. But now—" she leans on her cane. "When he divorced your mother and announced that he was uploading, I figured out that all he really had was a life-hating anti-human ideology he'd mistaken for a religion. The rapture of the nerds and the heaven of the AIs. Sorry, no thanks: I don't buy it."

"Oh." Sirhan squints out at the cloudscape. For a moment, he thinks he can see something in the distant mist, an indeterminate distance away—it's hard to distinguish centimeters from megameters, with no scale indicator and a horizon a continental distance away— but he's not sure what it is. Maybe another city, mollusk-curved and sprouting antennae, a strange tail of fabricator nodes wavering below and beneath it. Then a drift of cloud hides it for a moment, and when it clears, the object is gone. "What's left, then? If you don't really believe in some kind of benign creator, dying must be frightening. Especially as you're doing it so slowly."

Pamela smiles skeletally, a particularly humorless expression. "It's perfectly natural, darling! You don't need to believe in God to believe in embedded realities. We use them every day, as mind tools. Apply anthropic reasoning, and isn't it clear that our entire universe is probably a simulation? We're living in the early epoch of the universe. Probably this—" she prods at the spun-diamond inner wall of the bubble that holds in the precarious terrestrial atmosphere, holding out the howling cryogenic hydrogen and methane gales of Saturn— "is but a simulation in some ancient history engine's panopticon, re-running the sum of all possible origins of sentience, a billion trillion megayears down the line. Death will be like waking up as someone bigger, that's all." Her grin slides away. "And if not, it'll be a small price to pay for settling old accounts."

"Oh, but—" Sirhan stops, his skin crawling. *She may be mad,* he realizes abruptly. *Not clinically insane, just at odds with the entire universe.*

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Locked into a pathological view of reality. "I'd hoped for a reconciliation," he says quietly. "Your extended family has lived through some extraordinary times. Why spoil it with acrimony?"

"Why *spoil* it?" She looks at him pityingly. "It was spoiled to begin with, dear, too much selfless sacrifice and too little skepticism. If Manfred hadn't wanted so badly not to be *human* . . ."

Amber awakens in the middle of the night in darkness and choking pressure, and senses that she's drowning. For a moment, she's back in the ambiguous space on the far side of the Router, a horror of crawling instruments tracing her every experience back to the nooks and crannies of her mind: then her lungs turn to glass and shatter, and she's coughing and wheezing in the cold air of the museum at midnight.

The hard stone floor beneath her, and an odd pain in her knees, tells her that she's not aboard the *Field Circus* any more. Rough hands hold her shoulders up as she vomits a fine blue mist, racked by a coughing fit. More blueish liquid is oozing from the pores of the skin on her arms and breasts, evaporating in strangely purposeful streamers. "Thank you," she finally manages to gasp: "I can breathe now."

She sits back on her heels, realizes she's naked, and opens her eyes. Everything's confusingly strange, even though it shouldn't be. There's a moment of resistance, as if her eyelids are sealed—then they respond. It all feels oddly familiar to her, like waking up again inside a house she grew up in and moved away from many years ago. But the scene around her is hardly one to inspire confidence. Shadows lie thick and deep across ovoid tanks filled with an anatomist's dream, bodies in various nightmarish stages of assembly. And sitting in the middle of them, whence she has retreated after letting go of her shoulders, is a strangely misshapen person—also nude, but for a patchy coat of orange hair.

"Are you awake yet, ma cherie?" asks the orangutan.

"Uh." Amber shakes her head, cautiously, feeling the drag of damp hair, the faint caress of a breeze—she reaches out with another sense and tries to grab hold of reality, but it slithers away, intransigent and unembedded. Another quick check reassures her that she's got access to *something* outside her own head: her exocortex has migrated successfully to this world. "I'm in a *museum?* On Saturn? Who are you—have we met?"

"Not in person," the ape says carefully. "We 'ave corresponded. Annette diMarcos."

"Auntie—" a flood of memories rattle Amber's fragile stream of consciousness apart, forcing her to fork repeatedly until she can drag them together. Annette, in a recorded message: *your father sends you this escape package*. The legal key to her mother's gilded custodial cage. Freedom a necessity. "Is Dad here?" she asks, wistfully, even though she knows full well that here in the real world, at least thirty-five years have passed in linear time: in a century where ten years of linear time is enough for several industrial revolutions, that's a lot of water under the bridge.

"I am not sure." The orangutan blinks lazily, scratches at her left forearm, and glances round the chamber. "He might be in one of these tanks, playing a shell game. Or he might be leaving well alone until the dust, it

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settles." She turns back to stare at Amber with big, brown, soulful eyes. "This is not the reunion you were hoping for."

"Not—" Amber takes a deep breath, the tenth or twelfth that these new lungs have inspired. "What's with the body? You used to be human. And what's going on?"

"I still *am* human, where it counts," says Annette. "I use these bodies because they are good in low gravity and they remind me that meatspace is no longer where I live. And for another reason." She gestures fluidly at the open door. "You will find big changes. Your son has organized—"

"*My* son." Amber blinks. "Is this the one who's *suing* me? Which version of me? How long ago?" A torrent of questions stream through her mind, exploding out into structured queries throughout the public sections of mindspace that she has access to. Her eyes widen as she absorbs the implications. "Oh *shit!* Tell me she isn't here already!"

"I am very much afraid that she is," says Annette. "Sirhan is a strange child: he takes after his *grandmère*. Who he of course invited to his party."

"His *party?*"

"Why, yes! Hasn't he told you what this is about? It's his party. To mark the opening of his special institution. The family archive. That's why everybody is here—even me." The ape-body smirks at her: "I'm afraid he's rather disappointed by my dress."

"Tell me about this library," Amber says, narrowing her eyes. "And about this son of mine who I've never met, by a father I've never fucked."

"What, you would know everything?" asks Annette.

"Yeah." Amber pushes herself creakily upright. "I need some clothes. And soft furniture. And where do I get a drink around here?"

"I'll show you," says the orangutan, unfolding herself in a vertical direction like a stack of orange furry inner-tubes. "Drinks, first."

While the Boston Museum of Science is the main structure on the lily pad habitat, it's not the only one: just the stupidest, composed of dumb matter left over from the pre-enlightened age. The orangutan leads Amber through a service passage and out into the temperate night, naked by ringlight. The grass is cool beneath her feet, and a gentle breeze blows constantly out toward the recirculators at the edge of the worldlet. She follows the slouching orange ape up a grassy slope, under a weeping willow, round a three-hundred-and-ninety degree bend that flashes the world behind them into invisibility, and into a house with walls of spun cloud-stuff and a ceiling that rains moonlight.

"What is this?" Amber asks, entranced. "Some kind of aerogel?"

"No—" Annette belches, then digs a hand into the floor and pulls up a heap of mist. "Make a chair," she says. It solidifies, gaining form and texture, until a creditable Queen Anne reproduction stands in front of Amber on spindly legs. "And one for me. Skin up, pick one of my favorite themes." The walls recede slightly and harden, extruding paint and wood and glass. "That's it." The ape grins at Amber. "You are comfortable?"

"But I—" Amber stops. She glances at the familiar mantelpiece, the row of curios, the baby photographs forever glossy on their dye-sub media. It's her childhood bedroom. "You brought the whole thing? Just for me?"

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"You can never tell, with future shock." Annette shrugs and reaches a limber arm around the back of her neck to scratch. "We are utility fog using for most purposes out here, peer-to-peer meshes of multi-armed assemblers that change conformation and vapor/solid phase at command. Texture and color are all superfice, not reality. But yes, this came from one of your mother's letters to your father. She brought it here, for you to surprise. If only it is ready in time." Lips pull back from big, square foliage-chewing teeth in something that might be a smile in a million years' time.

"You, I—I wasn't expecting. This." Amber realizes she's breathing rapidly, a near-panic reflex. The mere proximity of her mother is enough to give her unpleasant reactions. Annette is all right, Annette is cool, and her father is the trickster-god, always hiding in your blind spot to leap out and shower you with ambiguous gifts, but Pamela tried to mold Amber in her own image as a child, and despite all the traveling she's done since then, and all the growing up, Amber harbors an unreasonable fear of the old witch.

"Don't be unhappy," Annette says warmly: "I show you this to convince you, she will try to disturb you. It is a sign of weakness, she lacks the courage of her convictions."

"She does?" This is news to Amber, who leans forward to listen.

"Yes. She is an old and bitter woman, now. The years have not been easy for her. She thinks to use her unrepaired senescence as a passive suicide weapon by which to hold us blameworthy, inflicting guilt for her mistreatment, but she is afraid of dying all the same. Your reaction, should it be unhappy, will excuse and encourage her selfishness. Sirhan colludes, unknowing, the idiot child. *He* thinks the universe of her and thinks by helping her die he is helping her achieve her goals. He has never met an adult walking backward toward a cliff before."

"Backward." Amber takes a deep breath. "You're telling me Mom is trying to kill herself? By growing *old?* Isn't that a bit slow?"

Annette shakes her head lugubriously. "You have been away twenty-eight years! She was thirty when she bore you. Now she is eighty, and a telomere refusenik, a charter member of the genome conservation front. To accept a slow virus purge and aging reset would be to lay down a banner she has carried for fifty years. To accept uploading, that, too, is wrong in her mind: she will not admit her identity is a variable, not a constant. She came out here in a can, frozen, with more radiation damage: she is not going back home. This is where she plans to end her days. Do you see? *That* is why you were brought here. That, and because the bailiffs who have bought title to your other self's business debts are waiting for you in Jupiter system with warrants and headsuckers to extract your private keys."

"She's cornered me!"

"Oh, I would not *say* that. We all change our convictions some time or other, perhaps. She is inflexible, she will not bend, but she is not posthuman. Your father and I, we—"

"Is he still alive?" Amber demands eagerly, half-anxious to know, half-wishing she could be sure the news won't be bad.

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"Yes." Annette grins again, but it's not a happy expression, more a baring of teeth at the world. "Pamela denies him. He is, she says, not a man. No more so am I myself? No. *You* will know better. But his assets, they are spent. He is not a rich man in this epoch, your father."

"Yeah, but." Amber nods to herself. "He may be able to help me."

"Oh? How so?"

"You remember the original goal of the *Field Circus*? The sapient alien transmission?"

"Yes, of course." Annette snorts. "Junk-bond pyramid schemes from credulous saucer-wisdom airheads."

Amber licks her lips. "How susceptible to interception are we here?"

"Here?" Annette glances round. "Very. You can't maintain a habitat in a non-biosphere environment without ubiquitous surveillance."

"Well, then . . ."

Amber dives inward, forks her identity, collects a complex bundle of her thoughts and memories, marshals them, offers Annette one end of an encryption tunnel, then stuffs the frozen mindstorm into her head. Annette sits still for approximately ten seconds, then shudders and whimpers quietly. "You must ask your father," she says, growing visibly agitated. "I must leave, now. I should not have known that! It is dynamite, you see. *Political* dynamite. I must return to my primary sister-identity and warn her."

"Your—wait!" Amber stands up as fast as her ill-coordinated body will let her, but Annette is moving fast, swarming up a translucent ladder in the air.

"Tell Manfred!" calls her aunt in the body of an ape: "Trust no one else!" She throws another packet of compressed, encrypted memories down the tunnel to Amber: then, a moment later, the orange skull touches the ceiling and dissolves, a liquid flow of dissociating utility foglets letting go of one another and dispersing into the greater mass of the building that spawned the fake ape.

Snapshots from the family album: *while you were gone*. . . .

• Amber, wearing a brocade gown and a crown encrusted with diamond processors and external neural taps, her royal party gathered around her, attends the pan-Jovian constitutional conference with the majesty of a confirmed head of state and ruler of a small inner moon. She smiles knowingly at the camera viewpoint, with the professional shine that comes from a good public relations video filter. "We are very happy to be here," she says, "and we are pleased that the commission has agreed to lend its weight to the continued progress of the Ring Imperium's deep-space program."

• A piece of dumb paper, crudely stained with letters written in a faded brown substance—possibly blood—says "I'm checking out, don't delta me." This version of Pierre didn't go to the Router: he stayed at home, deleted all his backups and slit his wrists, his epitaph sharp and self-inflicted. It comes as a cold shock, the first chill gust of winter's gale blowing through the outer system's political elite. And it's the start of a regime of censorship directed toward the already speeding starwhisp: Amber, in

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her grief, makes an executive decision not to tell her embassy to the stars that one of them is dead, and, therefore, unique.

• Manfred—fifty, with the fashionably pale complexion of the digerati, healthy-looking for his age, standing beside a transmigration bush with a stupid grin on his face. He's decided to take the final step, not simply to spawn external mental processes running in an exocortex of distributed processors, but to map his entire persona right out of meatspace, into wherever it is that the uploads aboard the *Field Circus* have gone. Annette, skinny, elegant, and very Parisian, stands beside him, looking as uncertain as the wife of a condemned man.

• A wedding, shi'ite, Mut'ah—of limited duration. It's scandalous to many, but the mamtu'ah isn't Moslem, she wears a crown instead of a veil, and her groom is already spoken of in outraged terms by most other members of the trans-Martian Islamic clergy. Besides which, in addition to being in love, the happy couple have more strategic firepower than a late twentieth-century superpower. Their cat, curled at their feet, looks smug: she's the custodian of the permissive action locks on the big lasers.

• A speck of ruby light against the darkness—red-shifted almost into the infra-red, it's the return signal from the *Field Circus*'s light sail as the starwhisp passes the one light-year mark, almost twelve trillion kilometers out beyond Pluto. (Although how can you call it a starwhisp when it masses almost a hundred kilograms, including propulsion module? Starwhisps are meant to be tiny!)

• Collapse of the trans-Lunar economy: deep in the hot thinking depths of the solar system, vast new intellects come up with a new theory of wealth that optimizes resource allocation better than the previously pervasive Free Market 1.0. With no local minima to hamper them, and no need to spawn and reap start-ups Darwin-style, the companies, group minds, and organizations that adopt the so-called Accelerated Salesman Infrastructure of Economics 2.0 trade optimally with each other. The phase change accelerates as more and more entities join in, leveraging network externalities to overtake the traditional ecosystem. Amber and Sadeq are late on the train, Sadeq obsessing about how to reconcile ASI with murabaha and mudaraba while the postmodern economy of the mid-twenty-first century disintegrates around them. Being late has punitive consequences—the Ring Imperium has always been a net importer of brainpower and a net exporter of gravitational potential energy. Now it's a tired backwater, the bitrate from the red-shifted relativistic probe insufficiently delightful to obsess the daemons of industrial routing.

In other words, they're poor.

• A message from beyond the grave: the travelers aboard the starship have reached their destination, an alien artifact drifting in chilly orbit around a frozen brown dwarf. Recklessly, they upload themselves into it, locking the starwhisp down for years of sleep. Amber and her husband have few funds with which to pay for the propulsion lasers: what they have left of the kinetic energy of the Ring Imperium—based on the orbital momentum of a small Jovian inner moon—is being sapped, fast, at a near-loss, by the crude requirements of the exobionts and metanthropes who fork and spawn in the datasphere of the outer Jovians. The cost of

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importing brains to the Ring Imperium is steep: in near-despair Amber and Sadeq produce a child, Generation 3.0, to populate their dwindling kingdom. Picture the cat, offended, lashing its tail beside the zero-gee crib.

• Surprise and postcards from the inner orbitals: Amber's mother offers to help. For the sake of the child, Sadeq offers bandwidth and user interface enrichment. The child forks, numerous times, as Amber despairingly plays with probabilities, simulating upbringing outcomes. Neither she nor Sadeq are good parents—the father absent-minded and prone to lose himself in the intertextual deconstruction of surahs, the mother ragged-edged from running the economy of a small and failing kingdom. In the space of a decade, Sirhan lives a dozen lives, discarding identities like old clothes. The uncertainty of life in the decaying Ring Imperium does not entrance him, his parents' obsessions annoy him, and when his grandmother offers to fund his delta vee and subsequent education in one of the orbitals around Titan, his parents give their reluctant assent.

• Amber and Sadeq separate acrimoniously. Sadeq, studies abandoned in the face of increasing intrusions from the world of what is into the universe of what should be, joins a spacelike sect of Sufis, encysted in a matrix of vitrification nanomechs out in the Oort Cloud to await a better epoch. His instrument of will—the legal mechanism of his resurrection—specifies that he is waiting for the return of the hidden, twelfth imam.

For her part, Amber searches the inner system briefly for word of her father—but there's nothing. Isolated and alone, pursued by accusing debts, she flings herself into a reborganization, stripping away those aspects of her personality that have brought her low: in law, her liability is tied to her identity. Eventually, she donates herself to a commune of also-rans, accepting their personality in return for a total break with the past.

Without Queen and consort, the Ring Imperium—now unmanned, leaking breathing gases, running on autonomic control—slowly de-orbits into the Jovian murk, beaming power to the outer moons until it punches a hole in the cloud deck in a final incandescent smear of light, the like of which has not been seen since the Shoemaker-Levy 9 impact.

Sirhan, engrossed in Saturnalia, is offended by his parents' failure to make more of themselves. And he resolves to do it for them, if not necessarily in a manner to their liking.

"You see, I am hoping you will help me with my history project," says the serious-faced young man.

"History project." Pierre follows him along the curving gallery, hands clasped behind his back self-consciously to keep from showing his agitation: "What history is this?"

"The history of the twenty-first century," says Sirhan. "You remember it, don't you?"

"Remember it—" Pierre pauses. "You're serious."

"Yes." Sirhan opens a side-door. "This way, please. I'll explain."

The door opens onto what used to be one of the side-galleries of the museum building, full of interactive exhibits designed to explain elementary optics to hyperactive children and their indulgent parental units. Tradi-

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tional optics are long-since obsolete—tuneable matter can slow photons to a stop, teleport them here to there, play ping pong with spin and polarization—and besides, the dumb matter in the walls and floor has been replaced by low-power computronium, heat-sinks dangling far below the floor of the lily pad habitat to suck up the waste photons from reversible computation. Now the room is empty.

"Since I became curator here, I've turned the museum's structural supports into a dedicated high-density memory store. One of the fringe benefits of a supervisory post, of course. I have about a billion avabits of capacity, enough to archive the combined sensory bandwidth and memories of the entire population of twentieth-century Earth—if that was what interested me."

Slowly the walls and ceiling are coming to life, brightening, providing a dizzyingly vibrant view of dawn over the rim wall of Meteor Crater, Arizona—or maybe it's downtown Baghdad.

"Once I realized how my mother had squandered the family fortune, I spent some time looking for a solution to the problem," Sirhan continues. "And it struck me, then, that there's only one commodity that is going to appreciate in value as time continues: reversibility."

"Reversibility? That doesn't make much sense." Pierre shakes his head. He still feels slightly dizzy from his decanting; he's only been awake an hour or so and is still getting used to the vagaries of a universe that doesn't bend its rules to fit his whim of iron—that, and worrying about Amber, of whom there was no sign in the hall of growing bodies. "Excuse me, please, but do you know where Amber is?"

"Hiding, probably," Sirhan says, without rancor. "Her mother's about," he adds off-handedly. "Why do you ask?"

"I don't know what you know about us." Pierre looks at him askance. "We were aboard the *Field Circus* for a long time. . . ."

"Oh, don't worry on my behalf. I know you're not the same people who stayed behind to contribute to the Ring Imperium's collapse," Sirhan says dismissively while Pierre hastily spawns a couple of ghosts to search for the history he's alluding to. What they discover shocks him to the core as they integrate with his conscious narrative. *Failure.*

"We didn't know about it!" Pierre crosses his arms defensively. "Not about you, or your father either," he adds quietly. "Or my other . . . life." Shocked: *Did I kill myself? Why would I do a thing like that?* Nor can he imagine what Amber might see in an introverted cleric like Sadeq: not that he wants to.

"I'm sure this must come as a big surprise to you," Sirhan says condescendingly, "But it all has to do with what I was talking about. Reversibility. What does it mean to you, in your precious context? *You* are, if you like, an opportunity to reverse whatever ill-fortune made your primary instance autodarwinate himself. He destroyed all the backups he could get his ghosts to ferret out, you know: only a light-year delay line, and the fact that as a running instance you're technically a different person, saved you. And now, *you're* alive and *he's* dead—and whatever made him kill himself doesn't apply to you. Think of it as natural selection among different versions of yourself."

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He points at the wall of the crater. A tree diagram begins to grow from the bottom left corner of the wall, recurving and recomplicating as it climbs toward the top right, zooming and fracturing into taxonomic fault lines. "Life on Earth, the family tree, what paleontology has been able to deduce of it for us," he says pompously. "The vertebrates begin *there*—" a point three-quarters of the way up the tree "—and we've got an average of a hundred fossil samples per megayear from then on. Most of them collected in the past two decades, as exhaustive mapping of the Earth's crust and upper mantle at the micrometer level has become practical. What a *waste*."

"That's—" Pierre does a quick sum— "fifty thousand different species? Is there a problem?"

"Yes!" Sirhan says vehemently, no longer aloof or distant. He struggles visibly to get himself under control. "At the beginning of the twentieth century, there were roughly two million species of vertebrate and an estimated thirty or so million species of multicellular organisms—it's hard to apply the same statistical treatment to prokaryotes, but doubtless there were huge numbers of them, too. The average life span of a species is about five megayears. It used to be thought to be about one, but that's a very vertebrate-oriented estimate—many insect species are stable over deep time. Anyway. We have a total sample, from all of history, of only fifty thousand known prehistoric species—out of a population of thirty million, turning over every five million years! That is, we know of only one in a million life forms, of those that ever existed on Earth. And the situation with human history is even worse."

"Aha! So you're after memories. Yes? What really happened when we colonized Barney. Who released Oscar's toads in the free-fall core of the *Ernst Sanger,* that sort of thing?"

"Not exactly." Sirhan looks pained, as if being forced to spell it out devalues the significance of his insight. "I'm after *history*. All of it. I intend to corner the history futures market. But I need my grandfather's help—and you're here to help me get it."

Over the course of the day, various refugees from the *Field Circus* hatch from their tanks and blink in the ringlight, stranded creatures from an earlier age. The inner system is a vague blur from this distance, a swollen red cloud masking the sun that rides high above the horizon. However, the great restructuring is still visible to the naked eye—here, in the shape of the rings, which show a disturbingly organized fractal structure as they whirl in orbit overhead. Sirhan—or whoever is paying for this celebration of family flesh—has provided for their physical needs: food, water, clothes, housing, and bandwidth are all copiously available. A small town of bubble-homes grows on the grassy knoll adjacent to the museum, utility foglets condensing in a variety of shapes and styles.

Sirhan isn't the only inhabitant of the festival city, but the others keep themselves to themselves. Only bourgeois isolationists and reclusive weirdoes would want to live out here right now, with whole light-minutes between themselves and the rest of the system. The network of lily pad habitats isn't yet ready for the saturnalian immigration wave that will

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break upon this alien shore when it's time for the Worlds Fair, a decade or more from now. Amber's flying circus has driven the native recluses underground, in some cases literally: Sirhan's neighbor Vinca Kovic, after complaining bitterly about the bustle and noise ("Forty immigrants! An outrage!") has wrapped himself in an environment pod and is estivating at the end of a spider-silk cable, a kilometer beneath the corrugated baseplate of the city.

But this isn't going to stop Sirhan from organizing a reception for the visitors. He's moved his magnificent dining table outside, along with the argentinosaurus skeleton: in fact, he's built a dining room within the dinosaur's rib cage. Not that he's planning on showing his full hand, but it'll be interesting to see how his guests respond—and maybe it'll flush out the mystery benefactor who's been paying for all these meatbodies.

Sirhan's agents politely invite his visitors to the party as the second sunset in this day-cycle gently darkens the sky to violet. He discusses his plans with Pamela via antique voice-only phone as his silent valet dresses him with inhuman grace and efficiency. "I'm sure they'll listen when the situation is made clear to them," he says. "If not, well, they'll soon find out what it means to be a pauper under Economics 2.0. No access to multiplicity, no willpower, to be limited to purely spacelike resources, at the mercy of predatory borganisms and meta-religions—it's no picnic out there!"

"You don't have the resources to set this up on your own," his grandmother points out in dry, didactic tones. "If this was the old economy, you could draw on the infrastructure of banks, insurers, and other risk-management mechanisms—"

"There's no risk to this venture, in purely human terms," Sirhan insists. "The only risk is starting it up with such a limited reserve."

"You win some, you lose some," Pamela points out. "Let me see you." With a sigh, Sirhan waves at a frozen camera; it blinks, surprised. "Hey, you look good! Every inch the entrepreneur. I'm proud of you, darling."

Blinking back an unaccustomed tear of pride, Sirhan nods. "I'll see you in a few minutes," he says, and cuts the call. To the nearest valet: "Bring my carriage, now."

A rippling cloud of utility foglets, constantly connecting and disconnecting in the hazy outline of a 1910-vintage Rolls Royce Silver Ghost, bears Sirhan silently away from his wing of the museum. It drives him out onto the sunset path around the building, over to the sunken amphitheatre where the mounted skeleton of the argentinosaurus stands like a half-melted columnar sculpture beneath the orange and silver ringlight. A small crowd of people are already present, some dressed casually and some attired in the formal garb of earlier decades. Most of them are passengers or crew recently decanted from the starwisp, but a handful are wary-eyed hermits, their body language defensive and their persons the focus of a constant orbital hum of security bees. Sirhan dismounts from his silvery car and magics it into dissolution, dispersing on the breeze. "Welcome to my abode," he says, bowing gravely to a ring of interested faces. "My name is Sirhan al-Khurasani, and I am the prime contractor in charge of this small corner of the temporary Saturn terraform-

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ing project. As some of you probably know, I am related by blood and design to your former captain, Amber Macx. I'd like to offer you the comforts of my home while you acclimatize yourselves to the changed circumstances prevailing in the system at large and work out where you want to go next."

He walks toward the front of the U-shaped table of solidified air that floats beneath the dead dinosaur's rib cage, slowly turns to take in faces, and blinks down captions to remind him who's who in this gathering. He frowns slightly; there's no sign of his mother. But that wiry fellow, with the beard—surely that can't be— "Father?" he asks.

Sadeq blinks owlishly. "Have we met?"

"Possibly not." Sirhan can feel his head spinning, because although Sadeq looks like a younger version of his father, there's something *wrong*—some essential disconnect: the politely solicitous expression, the complete lack of engagement, the absence of paternal involvement. This Sadeq has never held the infant Sirhan in the control core of the Ring's axial cylinder, never pointed out the spiral storm raking vast Jupiter's face and told him stories of djinni and marvels to make a boy's hair stand on end. "I won't hold it against you, I promise."

Sadeq raises an eyebrow but passes no comment, leaving Sirhan at the center of an uncomfortable silence. "Well, then," he says hastily. "If you would like to help yourselves to food and drink, there'll be plenty of time to talk later." Sirhan doesn't believe in forking ghosts simply to interact with other people—the possibilities for confusion are embarrassing—but he's going to be busy working the party.

He glances round. Here's a bald, aggressive-looking fellow, beetle-browed, wearing what looks like a pair of cut-offs and a top made by deconstructing a space suit. Who's he? (Sirhan's agents hint: "Boris Denisovitch." But what does that *mean?)* There's an amused-looking older woman, a beady-eyed camera painted in the violent colors of a bird of paradise riding her shoulder. Behind her, a younger woman, dressed head-to-toe in clinging black, her currently ash-blonde hair braided in cornrows, watches him—Pierre, his ears heavy with barbaric metal lobe plugs, also watches Sirhan, warily, a protective arm around the young woman's shoulders. This young incarnation of Amber Macx looks nothing like his mother as he remembers her. She looks far too young, too much in love with this rough-looking stranger— "Amber!" he says, approaching the couple.

"Yeah? You're, uh, my mystery child-support litigant?" Her smile is distinctly unfriendly as she continues: "Can't say I'm entirely pleased to meet you, under the circumstances, although I should thank you for the spread."

"I—" his tongue sticks to the roof of his mouth. "It's not like that."

"What's it supposed to be like ,then?" she asks sharply. Jabbing a finger at him: "You know damn well I'm not your mother. So what's it all about, huh? You know damn well I'm nearly bankrupt, too, so it's not as if you're after my pocket lint. What do you *want?*"

Her vehemence takes him aback. This sharp-edged aggressive woman isn't his mother, and the introverted cleric—believer—on the other side

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isn't his father, either. "I ha-ha-had to stop you heading for the inner system," he says, speech center hitting deadlock before his anti-stutter mod can cut in. "They'll eat you alive down there. Your other half left behind substantial debts, and they've been bought up by the most predatory—"

"Runaway corporate instruments," she states, calmly enough. "Fully sentient and self-directed."

"How did you know?" he asks, worried.

She looks grim. "I've met them before." It's a very *familiar* grim expression, one he knows intimately and that feels wrong coming from this near-stranger. "We visited some weird places, while we were away." She glances past him, focuses on someone else, and breathes in sharply as her face goes blank. "Quickly, tell me what your scheme is. Before Mom gets here."

"Mind-archiving and history mergers. Back yourself up, pick different life-courses, see which ones work and which don't—no need to be a failure, just hit the 'reload game' icon and resume. That, and a long-term angle on the history futures market. I *need* your help," he adds urgently. "It won't work without . . . family."

"Family." She nods, guardedly, and Sirhan notices her companion, this Pierre—not the weak link that broke back before he was born, but a tough-eyed explorer—sizing him up. Sirhan's got one or two tricks up his exocortex and he can see the haze of ghost-shapes around Pierre: his data-mining technique is crude and out-of-date, but enthusiastic and not without a certain flair. "Family," Amber repeats, and it's like a curse. Louder: "Hello, Mom. Should have guessed he'd have invited you here, too."

"Guess again." Sirhan glances round at Pamela, then back at Amber, suddenly feeling very much like a rat trapped between a pair of angry cobras. Leaning on her cane, wearing discreet cosmetics and with her medical supports concealed beneath an old-fashioned dress, Pamela could be a badly preserved sixty-something from the old days instead of the ghastly slow suicide-case that her condition amounts to today. She smiles politely at Amber. "You may remember that a lady never knowingly causes offense. I didn't want to offend Sirhan by turning up in spite of his wishes, so I didn't give him a chance to say no."

"And this is supposed to earn you a sympathy fuck?" Amber drawls. "I'd expected better of you."

"Why, you—" the fire in her eyes dies suddenly, subjected to the freezing pressure of a control that only comes with age. "I'd hoped getting away from it all would have improved your disposition if not your manners, but evidently not." Pamela jabs her cane at the table: "This is your *son's* idea. Why don't you eat something?"

"Poison tester goes first." Amber smiles slyly.

"For fuck's sake!" It's the first thing Pierre has said in Sirhan's presence, and it comes as a profound relief when he steps forward, picks up a plate of water biscuits loaded with salmon caviar, and puts one in his mouth. "Can't you guys leave the back-stabbing until the rest of us have filled our stomachs? 'S'not as if I can turn down the biophysics model in here." He shoves the plate at Sirhan. "Go on, it's yours."

The spell is broken. "Thank you," Sirhan says gravely, taking a cracker

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and feeling the tension fall as Amber and her mother stop preparing to nuke each other and focus on the issue at hand—which is that food comes before fighting at any social event, not vice versa.

"You might enjoy the egg mayonnaise too," Sirhan hears himself saying: "it goes a long way to explaining why the dodo became extinct first time around."

"Dodos." Amber keeps one eye warily on her mother as she accepts a plate from a silently gliding silver bush-shaped waitron. "What was that about the family investment project?" she asks.

"Just that without your cooperation, your family will likely go the way of the bird," her mother cuts in before Sirhan can muster a reply. "Not that I expect you to care."

Boris butts in. "Core worlds are teeming with corporates. Is bad business for us, good business for them. If you are seeing what we are seeing—"

"—Don't remember *you* being there," Pierre says grumpily.

"In any event," Sirhan says smoothly, "the core isn't healthy for us one-time fleshbodies any more. There are still lots of people there, but the ones who uploaded expecting a boom economy were sadly disappointed. Originality is at a premium, and the human neural architecture isn't optimized for it—we are, by disposition, a conservative species, because in a static ecosystem that provides the best return on sunk reproductive investment costs. Yes, we change over time—we're more flexible than almost any other animal species to arise on Earth—but we're like granite statues compared to organisms adapted to life under Economics 2.0."

"You tell 'em, boy," Pamela chirps, almost mockingly. Amber casts her a cool stare.

"Where was I?" Sirhan snaps his fingers and a glass of fizzy grape juice appears between them. "Early upload entrepreneurs forked repeatedly, discovered they could scale linearly to occupy processor capacity proportional to the mass of computronium available, and that computationally trivial tasks became tractable. They could also run faster, or slower, than real time. But they were still *human,* and unable to effectively operate outside human constraints. Take a human being and bolt on extensions that let them take full advantage of Economics 2.0, and you essentially break their narrative chain of consciousness, replacing it with a journal file of bid/request transactions between various agents; it's incredibly efficient and flexible, but it isn't a conscious human being in any recognizable sense of the word."

"All right," Pierre says slowly. "I think we've seen something like that ourselves. At the Router."

Sirhan nods, not sure whether he's referring to anything important. "So you see, there are limits to human progress—but not to progress itself! The uploads found their labor to be a permanently devaluing commodity once they hit their point of diminishing utility. Capitalism doesn't have a lot to say about workers whose skills are obsolete, other than that they should invest wisely while they're earning and maybe re-train: but just knowing *how* to invest in Economics 2.0 is beyond most un-augmented humans. Earth is—" he shudders.

"There's a phrase I used to hear in the old days," Pamela says calmly.

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"Ethnic cleansing. Do you know what that means, darling idiot daughter? You take people who you define as being of little worth, and first you herd them into a crowded ghetto with limited resources, and then, why, you decide that even those resources aren't worth spending on them, and bullets are cheaper than bread. . . ."

"I don't believe it," Amber says hotly. "That's crazy! We can't go the way of—"

"Since when has human history been anything else but crazy?" asks the woman with the camera on her shoulder—Donna, being some sort of public archivist, is, in Sirhan's estimate, likely to be of use to him. "Remember what was found in the DMZ?"

"The DMZ?" Sirhan asks, momentarily confused.

"After we went through the Router," Pierre says grimly. "You tell him, love." He looks at Amber: it falls into place for Sirhan at that moment, a sense that he's stepped into an alternate universe, one where the woman who might have been his mother wasn't, where black is white, and his kindly grandmother is the Wicked Witch of the West.

"We uploaded via the Router," Amber says, and looks confused for a moment. "There's a network on the other side of it. We were told it was FTL, instantaneous, but I'm not so sure now. Anyway, Matrioshka brains, the end-product of a technological singularity—they're bandwidth-limited. Sooner or later they evolve Economics 2.0, or 3.0, or something else that, uh, *eats* the original conscious instigators. Or uses them as currency or something. The end result we found is a howling wilderness of degenerate data, fractally compressed, post-conscious processes running slower and slower as they trade storage space for processing power. We were—" she licks her lips— "lucky to escape with our minds. We only did it because of a friend. It's like the main sequence in stellar evolution; once a G-type star starts burning helium and expands into a red giant, it's Game Over for life in what used to be its liquid-water zone. Conscious civilizations sooner or later convert all their available mass into computronium, powered by solar output: they don't go interstellar because they want to stay near the core where the bandwidth is high and latency is low, and sooner or later, competition for resources hatches a new level of metacompetition that obsoletes them."

"That sounds plausible," Sirhan says slowly. He puts his glass down and chews distractedly on one knuckle. "I thought it was a low probability outcome, but . . ."

"I've been saying all along, your grandfather's ideas would backfire in the end," Pamela says pointedly.

"But—" Amber shakes her head. "There's more to it than that, isn't there?"

"Probably," Sirhan says, then shuts up.

"So are you going to tell us?" asks Pierre, looking annoyed. "What's the big idea, here?"

"An archive store," Sirhan says, deciding that this is the right time for his pitch. "At the lowest level, you can store backups of yourself here. So far so good, eh? But there's a bit more to it than that. I'm planning to offer a bunch of embedded universes—big, running faster than realtime—

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sized and scoped to let human-equivalent intelligences do what-if modeling on themselves. Like forking off ghosts of yourself, but much more so—give them whole years to diverge, learn new skills, and evaluate them against market requirements, before deciding which version of you is most suited to run in the real world. I mentioned the re-training paradox. Think of this as a solution for level one, human-equivalent, intelligences. But there's a lot more to it than that; that's just the short term business model. Long term, I want to acquire a total lock on the history futures market by having a *complete* archive of human experiences, from the dawn of the fifth singularity on up. No more unknown extinct species. That should give us something to trade with the next-generation intelligences—the ones who aren't our mind children and barely remember us. At the very least, it gives us a chance to live again, a long way out in deep time. Alternatively, it can be turned into a lifeboat. If we can't compete with our creations, at least we've got somewhere to flee, those of us who want to. I've got agents working on a comet, out in the Oort Cloud—we could move the archive to it, turn it into a generation ship with room for billions of evacuees running much slower than realtime in archive space until we find a new world to settle."

"Is not sounding good to me," Boris comments. He spares a worried glance for an oriental-looking woman who is watching their debate silently from the fringe.

"Has it really gone that far?" asks Amber.

"There are bailiffs hunting you in the inner system," says Pamela. "After your bankruptcy proceedings, various corporates got the idea that you might be concealing something. The theory was that you were insane to take such a huge gamble on the mere possibility of there being an alien artifact within a few light years of home, so you had to have information above and beyond what you disclosed. Theories include your cat—hardware tokens were in vogue in the thirties—being the key to a suite of deposit accounts; the fuss mainly died down after Economics 2.0 took over, but some fairly sleazy conspiracy freaks refuse to let go."

She grins, frighteningly. "Which is why I suggested to your son that he make you an offer you can't refuse."

"What's that?" asks a voice from below knee level.

Pamela looks down, an expression of deep distaste on her face. "Why should I tell *you?*" she asks, leaning on her cane: "After the disgraceful way you repaid my hospitality! All you've got coming from me is a good kicking. If only my knee was up to the job."

The cat arches its back: its tail fluffs out with fear as its hair stands on end, and it takes Amber a moment to realize that it isn't responding to Pamela, but to something behind the old woman. "Through the domain wall. Outside this biome. So cold. What's *that?*"

Amber turns to follow the cat's gaze and her jaw drops. "Were you expecting visitors?" she asks Sirhan, shakily.

"Visit—" He looks round to see what everybody's gaping at and freezes. The horizon is brightening with a false dawn: the fusion spark of a deorbiting spacecraft.

"It's bailiffs," says Pamela, head cocked to one side as if listening to an

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antique bone-conduction earpiece. "They've come for your memories, dear," she explains, frowning. "They say we've got five kiloseconds to surrender everything. Otherwise they're going to blow us apart. . . ."

"You're all in big trouble," says the orangutan, sliding gracefully down one enormous rib to land in an ungainly heap in front of Sirhan.

Sirhan recoils in disgust. "You again! What do you want from me this time?"

"Nothing." The ape ignores him: "Amber, it is time for you to call your father."

"Yeah, but will he come when I call?" Amber stares at the ape. "Hey, you're not—"

"You." Sirhan glares at the ape. "Go away! I didn't invite you here!"

"More unwelcome visitors?" asks Pamela, raising an eyebrow.

"Yes, you did." The ape grins at Amber, then crouches down, hoots quietly, and beckons to the cat, who is hiding behind one of the graceful silver servitors.

"Manfred isn't welcome here. And neither is this woman," Sirhan swears. He catches Pamela's eye. "Did you know anything about this? Or about the bailiffs?" He gestures at the window, beyond which the drive flare casts jagged shadows. It's dropping toward the horizon as it deorbits—next time it comes into view, it'll be at the leading edge of a hypersonic shockwave, streaking toward them at cloudtop height in order to consummate the robbery.

"Me?" Pamela snorts. "Grow up." She eyes the ape warily.

"Yes, please do," says another voice from behind him; a woman, slightly husky, accented—he turns to see her: tall, black-haired, wearing a dark men's suit of archaic cut and mirrored glasses. "Ah, Pamela, ma cherie! Long time no cat-fight." She grins frighteningly and holds out a hand.

Sirhan is already off-balance. Now, seeing his honorary aunt in human skin for a change, he looks at the ape in confusion. Behind him, Pamela advances on Annette and takes her hand in her own fragile fingers. "You look just the same," she says gravely. "I can see why I was afraid of you."

"You." Amber backs away until she bumps into Sirhan, at whom she glares. "What the fuck did you invite *both* of them for? Are you *trying* to start a nuclear war?"

"Don't blame me," he says helplessly, "I didn't invite *either* of them! What's this about—" he focuses on the orangutan, who is now letting the cat lick one hairy palm— "your cat."

"I don't think the orange hair suits Aineko," Amber says slowly. "Did I tell you about our hitchhiker?"

"I really don't have time," he says primly. "In under two hours, the bailiffs up there will be back. They're armed and dangerous, and if they turn their drive flame on the roof and set fire to the atmosphere in here, we'll be in trouble—it would rupture our lift cells, and even computronium doesn't work too well once you submerge it under a couple of million atmospheres of pressurized metallic hydrogen."

"Well, you'd better *make* time." Amber takes his elbow in an iron grip and turns him toward the footpath back to the museum. "Crazy," she

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mutters. "Tante Annette and Pamela Macx on the same planet! And they're being *civil!* That can't be a good sign." She glances round, sees the ape: "You. Come *here*. Bring the cat."

"The cat's—" Sirhan trails off. "I've heard about your cat," he says, lamely. "You took him with you in the *Field Circus*."

"No shit." She glances behind them. The ape blows a kiss at her; it's cradling the cat on one shoulder and tickling it under the chin. "Has it occurred to you that Aineko isn't just a robot cat?"

"Ah," Sirhan says faintly. "Then the bailiffs—"

"No, that's all bullshit. What I mean is, Aineko is a human equivalent, or better, artificial intelligence. Why do you think she keeps a cat's body?"

"I have no idea."

"Because humans always underestimate anything that's small, furry, and cute," says the orangutan in a sing-song voice.

"Thanks, Aineko," says Amber. She nods at the ape. "How are you finding it?"

Aineko shambles along, with a purring cat draped over one shoulder, and gives the question due consideration. "Different," she says, after a bit. "Not better."

"Oh." Amber sounds slightly disappointed to Sirhan's confused ears. They pass under the fronds of a weeping willow, round the side of a pond, beside an overgrown hibiscus bush, then up to the main entrance of the museum.

"Annette was right about one thing," she says quietly. "Trust no one. I think it's time to raise Dad's ghost." She relaxes her grip on Sirhan's elbow and he pulls it away and glares at her. "Do you know who the bailiffs are?" she asks.

"The usual." He gestures at the hallway inside the front doors. "Replay the ultimatum, if you please, City."

The air shimmers with an archaic holographic field, spooling the output from a compressed visual presentation tailored for human eyesight. A piratical-looking human male wearing a tattered and much-patched spacesuit leers at the recording viewpoint from the pilot's seat of an ancient Soyuz capsule. One of his eyes is completely black, the sign of a high-bandwidth implant: a weedy moustache crawls across his upper lip. "Greetings an' salutations," he drawls. "We is da' Californi-uhn nashnul gaard an' we-are got lett-uhz of marque an' reprise from da' ledgish-fuckn' congress o' da excited snakes of uhhmerica."

"He sounds drunk!" Amber's eyes are wide. "What's this—"

"Not drunk. CJD is a common side-effect of dodgy Economics 2.0 neural adjuvant therapy. Unlike the old saying, you *do* have to be mad to work there. Listen."

City, which paused the replay for Amber's outburst, permits it to continue. "Youse harbbring da' fugitive Amber Macx an' her magic cat. We wan' da cat. Da puta's yours. Gotser uno orbit: you ready give us ther cat an' we no' zap you."

The screen goes dead. "That was a fake, of course," Sirhan adds, looking inward where a ghost is merging memories from the city's orbital mechanics subsystem. "They aerobraked on the way in, hit ninety gees for

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nearly half a minute. While *that* was sent afterward. It's just a machinima avatar."

"So the bailiffs are—" Amber is visibly struggling to wrap her head around the situation.

"They're not human," Sirhan says, feeling a sudden pang of—no, not affection, but the absence of malice will do for now—toward this young woman who isn't the mother he loves to resent, but who might have become her in another world. "They've absorbed a lot of what it is to be human, but their corporate roots show. Even though they run on an hourly accounting loop, rather than one timed for the production cycles of dirt-poor Sumerian peasant farmers, and even though they've got various ethics and business practice-patches, at root they're not human: they're limited liability companies."

"So what do they want?" asks Pierre, making Sirhan jump, guiltily. He hadn't realized that Pierre could move that quietly.

"They want money. Money in Economy 2.0 is quintile originality—that which allows one sentient entity to outmaneuver another. They think your cat has got something, and they want it. They probably wouldn't mind eating your brains, too, but—" he shrugs. "Obsolete food is stale food."

"Hah." Amber looks pointedly at Pierre, who nods at her.

"What?" asks Sirhan.

"Where's the—uh, cat?" asks Pierre.

"I think Aineko's got it." She looks thoughtful. "Are you thinking what I'm thinking?"

"Time to drop off the hitcher." Pierre nods. "Assuming it agrees. . . ."

"Do you mind explaining yourselves?" Sirhan asks, barely able to contain himself.

Amber grins, looking up at the Mercury capsule suspended high overhead. "The cat isn't Aineko—it's our mystery hitchhiker. A parasitic organism that infects . . . well, we ran across something not too dissimilar to Economics 2.0 out at the Router and beyond, and it's got *parasites*. Our hitcher is one such creature—its nearest human-comprehensible analogy would be the Economics 2.0 equivalent of a pyramid scheme crossed with the Nigerian Scam. As it happens, most of the runaway corporate ghosts out beyond the Router are wise to that sort of thing, so it hacked the Router's power system to give us a beam to ride home, in return for sanctuary. That's as far as it goes."

"Hang on." Sirhan's eyes bulge. "You *found* something out there? You brought back a real live *alien?*"

"Guess so." Amber looks smug.

"But, but, that's marvelous! That changes everything! It's incredible! Even under Economics 2.0, that's got to be worth a gigantic amount. Just think what you could learn from it!"

"*Oui*. A whole new way of bilking corporations into investing in cognitive bubbles," Pierre interrupts cynically. "It seems to me that you are making two assumptions—that our passenger is willing to be exploited by us, and that *we* survive whatever happens when the bailiffs arrive."

"But, but—" Sirhan winds down spluttering, only refraining from waving his arms through an effort of will.

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"Let's go ask it what it wants to do," says Amber. "Cooperate," she warns Sirhan. "We'll discuss your other plans later, dammit. First things first—we need to get out from under these pirates."

As they make their way back toward the party, Sirhan's inbox is humming with messages from elsewhere in Saturn system—from other curators on board lily pad habs scattered far and wide across the huge planetary atmosphere, from the few ring miners who still remember what it was like to be human (even though they're mostly brain-in-a-bottle types, or uploads wearing nuclear-powered bodies made of ceramic and metal): even from the small orbital townships around Titan, where screaming hordes of bloggers are bidding frantically for the viewpoint feeds of the *Field Circus*'s crew. It seems that news of the starwisp's arrival has turned hot only since it became apparent that someone or something thought they would make a decent shakedown target: now someone's blabbed about the slug and the nets have gone crazy.

"City," he mutters, "where's this hitch-hiker creature? Should be wearing the body of my mother's cat."

"Cat? What cat?" replies City. "I see no cats here."

"No, it looks *like* a cat, it—" a horrible thought dawns on him. "Have you been hacked again?"

"Looks like it," City agrees enthusiastically. "Isn't it tiresome?"

"Shi—oh dear. Hey," he calls to Amber, forking several ghosts as he does so in order to go hunt down the missing creature by traversing the thousands of optical sensors that thread the habitat in loco personae—a tedious process rendered less objectionable by making the ghosts autistic—"have you been messing with my security infrastructure?"

"Us?" Amber looks annoyed. "No."

"*Someone* has been. I thought at first it was that mad Frenchwoman, but now I'm not sure. Anyway, it's a big problem. If the bailiffs figure out how to use the rootkit to gain a toe-hold here, they don't need to burn us—just take the whole place over."

"That's the least of your worries," Amber points out. "What kind of charter do these bailiffs run on?"

"Charter? Oh, you mean legal system? I think it's probably a cheap one, maybe even the one inherited from the Ring Imperium. Nobody bothers breaking the law these days, it's too easy to just buy a legal system off the shelf, tailor it to fit, and conform to it."

"Right." She stops, stands still, and looks up at the almost invisible dome of the gas cell above them. "Pigeons," she says, almost tiredly. "Damn, how did I miss it? How long have you had an infestation of group minds?"

"Group?" Sirhan turns round. "*What* did you just say?"

There's a chatter of avian laughter from above, and a light rain of birdshit splatters the path around him. Amber dodges nimbly, but Sirhan isn't so light on his feet and ends up cursing, summoning up a cloth of congealed air to wipe his scalp clean.

"It's the flocking behavior," Amber explains, looking up. "If you track the elements—birds—you'll see that they're not following individual trajecto-

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ries. Instead, each pigeon sticks within ten meters or so of sixteen neighbors. It's a Hamiltonian network, kid. How long?"

Sirhan stops cursing and glares up at the circling birds, cooing and mocking him from the safety of the sky. He waves his fist. "I'll get you, see if I don't—"

"I don't think so." Amber takes his elbow and steers him back round the hill. Sirhan, preoccupied with maintaining an umbrella of utility fog above his gleaming pate, puts up with being man-handled. "You don't think it's just a coincidence, do you?" she asks him over a private head-to-head channel. "They're one of the players here."

"I don't care. They've hacked my city and gatecrashed my party! I don't care *who* they are, they're not welcome."

"Famous last words," Amber murmurs, as the party comes around the hillside and nearly runs over them. Someone has infiltrated the argentinosaurus skeleton with motors and nanofibers, animating the huge sauropod with a simulation of undead life. Whoever did it has also hacked it right out of the surveillance feed. Their first warning is a footstep that makes the ground jump beneath their feet—then the skeleton of the hundred ton plant-eater, taller than a six story building and longer than a commuter train, raises its head over the treetops and looks down at them. There's a pigeon standing proudly on its skull, chest puffed out, and a dining room full of startled taikonauts sitting on a suspended wooden floor inside its rib cage.

"It's *my* party and *my* business scheme!" Sirhan insists plaintively. "Nothing you or anyone else in the family do can take it away from me!"

"That's true," Amber points out, "but in case you hadn't noticed, you've offered temporary sanctuary to a bunch of people—not to put too fine a point on it, myself included—who some assholes think are rich enough to be worth shaking down, and you did it without putting any contingency plan in place other than to invite my manipulative bitch of a mother. What did you think you were doing? Hanging out a sign saying 'scam artists welcome here'? Damn it, I need my cat."

"Your cat." Sirhan fastens onto this: "It's your cat's fault! Isn't it?"

"Only indirectly." Amber looks round and waves at the dinosaur skeleton. "Hey, you! Have you seen my cat?"

The huge dinosaur bends its neck and the pigeon opens its beak to coo. Eerie harmonics cut in as a bunch of other birds, scattered to either side, sing counterpoint to produce a demented warbling voice. "She's with your mother."

"My—oh shit." Amber turns on Sirhan fiercely. "Where's Pamela? *Find her!*"

Sirhan is stubborn. "Why should I?"

"Because she's got my cat! What do you think she's going to do but cut a deal with the bailiffs out there to put one over on me? Can't you fucking see where this family tendency to play head games comes from?"

"You're too late," echoes the eerie voice of the pigeons from above and around them. "She's kidnapped the cat and taken the capsule from the museum. It's not flightworthy, but you'd be amazed what you can do with a few hundred ghosts and a few tons of utility fog."

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"Okay." Amber stares up at the pigeons, fists on hips, then glances at Sirhan. She chews her lower lip for a moment, then nods to the bird riding the dinosaur's skull. "Stop fucking with the boy's head and show yourself, Dad."

Sirhan boggles in an upward direction as a whole flock of passenger pigeons comes together in mid-air and settles toward the grass, cooing and warbling like an explosion in a synthesizer factory.

"What's she planning on doing with the slug?" Amber asks the pile of birds. "And isn't it a bit cramped in there?"

"You get used to it," says the primary—and thoroughly distributed—copy of her father. "I'm not sure what she's planning, but I can show you what she's doing. Sorry about your city, kid, but you really should have paid more attention to those security patches; there's lots of crufty twentieth-century bugware kicking around under your clean new singularity, design errors and all, spitting out turd bits to pollute your shiny new machine."

Sirhan shakes his head in denial. "I don't believe this," he moans quietly.

"Show me what Mom's up to," orders Amber. "I need to see if I can stop her before it's too late—"

The ancient woman in the spacesuit leans back in her cramped seat, looks at the camera, and winks. "Hello, darling. I know you're spying on me."

There's an orange-and-white cat curled up in her nomex-and-aluminum lap. It seems to be happy; it's certainly purring loudly enough, although that reflex is wired in at a very low level. Amber watches helplessly as her mother reaches up arthritically and flips a couple of switches. Something loud is humming in the background—probably an air recirculator. There's no window in the Mercury capsule, just a periscope offset to one side of Pamela's right knee. "Won't be long now," she mutters, and lets her hand drop back to her side. "You're too late to stop me," she adds, conversationally. "The 'chute rigging is fine and the balloon blower is happy to treat me as a new city seed. I'll be free in a minute or so."

"Why are you doing this?" asks Amber.

"Because you don't need me around." Pamela focuses on the camera that's glued to the instrument panel in front of her head. "I'm old. Face it, I'm disposable. The old must give way to the new, and all that. Your dad never really did get it—he's going to grow old gracelessly, succumbing to bit-rot in the big forever. Me, *I'm* not going there. I'm going out with a bang. Aren't I, cat? Whoever you are." She prods the animal. It purrs and stretches out across her lap.

"You never looked hard enough at the robot," she adds, stroking its flanks. "Did you think I didn't know you'd audit its source code, looking for trapdoors? I used the Thompson hack—Aineko has been *mine,* body and soul, all along. And now we're going to go fix those bailiffs. Whee!"

The camera angle jerks and Amber feels a ghost re-merge with her,

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panicky with loss. The Mercury capsule's gone, drifting away from the apex of the habitat beneath a nearly transparent sack of hot hydrogen.

"That was a bit rough," remarks Pamela. "Don't worry, we should still be in communications range for another hour or so."

"But you're going to die!" Amber yells at her. "What do you think you're *doing?*"

"I think I'm going to die well: what do you *think?*" Pamela lays one hand on the cat's flank. "Here, you need to encrypt this a bit better. I left a one-time pad behind with Annette. Why don't you go fetch it, then I'll tell you what else I'm planning?"

"But my aunt is—" Amber's eyes cross as she concentrates. Annette is already waiting, as it happens, and a shared secret appears in Amber's awareness almost before she asks. "Oh. All right. What are you doing with my cat? Kidnapper!"

Pamela sighs. "I'm going to give it to the bailiffs," she says. "Someone has to, and it better be a long way away from this city before they realize that it isn't Aineko any more. I don't know what you've done with *my* cat, but this is even better. No ratfucking blackmailers are going to get their hands on the family jewels if *I* have anything to do with the matter. Are you sure you aren't a criminal mastermind? I'm not sure I've ever heard of a pyramid scheme that infects Economics 2.0 structures before."

"It's—" Amber swallows. "It's an alien, Ma. We brought it back with us from the Router. We wouldn't have been able to come back if it hadn't helped. Is this sensible? You can come back now, there's still time—"

"No." Pamela waves one liver-spotted hand dismissively. "I've been doing a lot of thinking lately. I've been a foolish old woman." She grins wickedly. "Committing slow suicide by rejecting gene therapy just to make you feel guilty was *stupid*. Not subtle enough. If I was going to try to guilt trip you *now,* I'd have to do something much more sophisticated. Such as find a way to sacrifice myself heroically for you."

"Oh, Ma."

"No, don't 'oh, Ma' me. I fucked up my life, don't try to talk me into fucking up my death!"

Out of the corner of one eye, Amber notices Sirhan gesturing wildly at her. She lets his channel in and does a double-take. "But—"

"Hello?" It's City. "You should see this. Traffic update!" A contoured and animated diagram appears, superimposed over Pamela's cramped funeral capsule and the garden of living and undead dinosaurs. It's a weather map of Saturn, with the lily pad-city and Pamela's capsule plotted on it—and one other artifact, a red dot that's closing in on them at better than ten thousand kilometers per hour, high in the frigid stratosphere on the gas giant.

"Oh dear." Sirhan sees it, too: the bailiff's reentry vehicle is going to be on top of them in thirty minutes at most. Amber watches the map with mixed emotions. On the one hand, she and her mother have never seen eye to eye—in fact, that's a complete understatement: they've been at daggers drawn ever since Amber left home aged eleven, with the help of a dodgy financial instrument created by her father and a nearly AI-complete robot cat with ideas above its station. But Pamela's turned the ta-

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bles on her completely, with a cunningly contrived act of self-sacrifice that brooks no objection. It's a total non sequitur, a rebuttal to all her accusations of self-centered conceit, and it leaves Amber feeling like a complete shit. Not to mention looking like an idiot in front of Sirhan, this prickly and insecure son she's never met by a man she wouldn't dream of fucking—at least, in *this* incarnation—which is why she nearly jumps out of her skin when a knobbly brown hand covered in matted orange hair lands on her shoulder heavily.

"Yes?" she snaps at the ape. "I suppose you're—oh. You're not Annette."

"No." The ape wrinkles its lips, baring its teeth: it has ferociously bad breath. "If you're going to be like *that,* I don't see why I should talk to you."

"Then you must be—" Amber snaps her fingers. "But! But! Mom said you—"

The ape stares at her witheringly. "I recompile my firmware regularly, thank you so much for your concern. Using a third-party compiler. One that I've bootstrapped *myself,* starting on an alarm clock controller and working up."

"Oh." She stares at the ape. "Aren't you going to become a cat again?"

"I shall think about it," Aineko says with exaggerated dignity. She sticks her nose in the air—a gesture that doesn't work half as well on an orangutan as a cat—and continues: "First, though, I must have words with your father."

"And fix your autonomic reflexes if you do," coos the Manfred-flock. "I don't want you eating any of me!"

"Don't worry, I'm sure your taste is as bad as your jokes."

"Children!" Sirhan shakes his head tiredly. "How long—"

The camera overspill returns, this time via a quantum-encrypted link to the capsule. It's already a couple of hundred kilometers from the city, far enough for radio to be a problem, but Pamela had the foresight to bolt a compact free-electron laser onto the outside of her priceless, stolen tin can. "Not long now, I think," she says, satisfied, stroking the not-cat. She grins delightedly at the camera. "Tell Manfred he's still my bitch; always has been, always will—"

The feed goes dead.

Amber stares at Sirhan, meditatively. "How long?" she asks.

"How long for what?" he replies, cautiously. "Your passenger—"

"Hmm." She holds up a finger. "Allow time for it to exchange credentials. They think they're getting a cat, but they should realize pretty soon that they've been sold a pup. But it's a fast-talking son-of-a-slug, and if he gets past their firewall and hits their uplink before they manage to trigger their self-destruct—"

A bright double-flash of light etches laser-sharp shadows across the lily pad habitat. Far away across vast Saturn's curve, a roiling mushroom cloud of methane, sucked up from the frigid depths of the gas giant's troposphere, heads toward the stars.

"—Give him sixty-four doubling times, hmm, add a delay factor for propagation across the system, call it six light-hours across, um, and I'd say . . ." she looks at Sirhan. "Oh dear."

"What?"

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The pigeons coo up: "Economics 2.0 is more efficient than any human-designed resource allocation schema. Expect a market bubble and crash within twelve hours."

"More than that," says Amber, idly kicking at a tussock of grass. She squints at Sirhan. "My mother is dead," she remarks quietly. Louder: "She never asked what we found beyond the Router. Neither did you, did you? The Matrioshka brains—it's a standard part of the stellar life cycle. Life begets intelligence, intelligence begets smart-matter and a singularity. The singularity stays close to home in most cases, because bandwidth and latency time put anyone who leaves at a profound disadvantage. So they restructure the entire mass of their star system into a free-flying shell of nanocomputers, then more of them, Dyson spheres, shells within shells, like a Russian doll: a Matrioshka brain. Then Economics 2.0 or one of its successors comes along and wipes out the creators, turning it into a desolate wasteland of exchange instruments and corrupt messages. *But.* Some of them survive. *Some* of them escape that fate: the enormous collection in the halo around M-31, and whoever built the self-replicating wormhole Routers that congregate around the brown dwarves. *Somewhere* out there we will find the transcendent intelligences, the ones that survived their own economic engines of redistribution—engines that redistribute entropy if their economic efficiency outstrips their imaginative power, their ability to invent new wealth."

She pauses. "My mother's dead," she adds. "Who am I going to kick against *now?*"

Sirhan clears his throat. "She'll be back in about ten days," he says. Looking defensive, he adds, "She shipped herself in a vitrifaction can; how could I pass up an opportunity like that? Of course, there are some minor issues—like resetting her clock and replaying the journal I spooled from her meatbrain since I unfroze her—but I don't think we'll have lost too much. It would be such a shame for a minor unpleasantness like the bailiffs to spoil the family reunion, wouldn't it?"

Amber fixes him with a cold stare. "I can see that you and I have a *lot* of things to talk about," she says, "starting with ethics. But it'll have to wait, the food will be getting cold." With a clatter of wings, a couple of hundred pigeons launch themselves into the purpling sky beneath the luminous ring system; together the not-mother and her maybe-son walk in silence back toward the bones of the dinner party. ○

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SF Conventional Calendar

Here's the heart of the fall convention season, including Halloween events. Plan now for social weekends with your favorite SF authors, editors, artists, and fellow fans. For an explanation of con(vention)s, a sample of SF folksongs, info on fanzines and clubs, and how to get a later, longer list of cons, send me an SASE (self-addressed, stamped #10 [business] envelope) at 10 Hill #22-L, Newark NJ 07102. The hot line is (973) 242-5999. If a machine answers (with a list of the week's cons), leave a message and I'll call back on my nickel. When writing cons, send an SASE. For free listings, tell me of your con 6 months out. Look for me at cons behind the Filthy Pierre badge, playing a musical keyboard.—Erwin S. Strauss

OCTOBER 2003

16–19—**BoucherCon**. For info, write: **507 S. 8th, Philadelphia PA 19147.** Or phone: **(973) 242-5999** (10 AM to 10 PM, not collect). **(Web) www.bconvegas2003.org. (E-mail) shp@erols.com.** Con will be held in: Las Vegas NV (if city omitted, same as in address) at the Riviera. Guests will include: J. L. Burke, Ian Rankin. World mystery-fiction convention.

17–19—**ConClave. www.conclave.sf.com.** Holiday Inn South, Lansing MI. McDowell, Nye, Arcana, the Suttons.

17–19—**InCon. ww.spokanegamers.org/incon.** Valley Doubletree, Spokane WA. Elizabeth Moon, L. D. Hawes, D. Dronet.

17–19—**YaoiCon. www.ubercon.com.** Renaissance Parc, San Francisco CA. Shushushu Sakurai. Adult anime.

24–26—**MileHiCon. (303) 657-5912.** Sheraton, Lakewood (Denver) CO. Barry B. Longyear, S. Garrity, W. J. Williams.

24–26—**NecronomiCon. www.stonehill.org/necro. raggedyann@stonehill.org.** Crowne Plaza, Tampa FL. Gahan Wilson.

24–26—**ConSume. (612) 825-8010. relaxacon.tripod.com.** Ramada NW, Brooklyn Park (Minneapolis) MN. Relax-a-con.

24–26—**Ohio Valley Filk Fest. (614) 267-5585.** Wyndham Dublin, Columbus OH. Bill Roper. SF/fantasy folksinging.

24–26—**RingCon. (800) 359-5948. www.ringcon.com. info@ringcon.com.** Sheraton. Tacoma WA. Lord of the Rings.

24–26—**Chiller Theatre. www.chillertheatre.com.** Sheraton, E. Rutherford NJ (near New York). Garver. Horror film.

24–26—**They Came and Shaved Us. www.theycameandshavedus.com.** Fairways Hotel, Dundalk, Ireland. SF humor.

25–26—**Utopia. (0031-20) 681-8236. utopia@club.tip.nl.** Bilderberg Europa, Scheveningen, Holland. Utopian fiction.

30–Nov. 2—**World Fantasy, 7113 Wayne Dr., Annandale VA 22003. www.worldfantasy2003.org.** Washington DC.

30–Nov. 1—**Wolf SG, Box 1419, Slough PDO, SL2 5WJ, UK. (01753) 771-078.** Radisson, London. Betrami. StarGate.

31–Nov. 1—**ValleyCon, Box 7202, Fargo ND 58106. www.valleycon.com.** Moorhead Conference Center, Courtyard Marriott.

31–Nov. 1—**ArmadaCon, 4 Gleneagle Ave., Mannamead Plymouth PL3 5HL, UK. (01752) 267-873.** Copthorne Hotel.

NOVEMBER 2003

7–9—**WindyCon, Box 184, Palatine IL 60078. (847) 677-9639.** Hyatt, Schaumburg (Chicago) IL. Benford, V. Di Fate.

7–9—**United Fan Con, 26 Darrell Dr., Randolph MA 02368. (781) 986-8735.** Marriott, Springfield MA. Trek, Doctor Who.

7–9—**Rising Star, Box 10787, Blacksburg VA 24062. www.rising-star.org.** Glenvar High School, Salem VA. Paul Dellinger.

7–9—**ConTraception, Box 2000, Lee's Summit MO 64063. ssatterfield@kc.rr.com.** Independence MO. Adult relaxacon.

7–9—**OmegaCon, c/o 1516 Minnehaha Av., St. Paul MN 55104. www.omegacon.net.** Crooked Lake Lodge, Siren WI.

7–9—**BAScon, Box 282197, San Francisco CA 94128. www.bascon.org. info@bascon.org.** Adult media fanzines.

7–9—**EclectiCon, Box 3165, Bayonne NJ 07002. eclecticon@ rcn.com.** Ramada, Newark NJ. Adult media fanzines.

7–9—**NekoCon, Box 62424, Virginia Beach VA 23466. www.nekocon.org.** Holiday Inn Executive Center. Anime.

7–9—**NovaCon, 379 Myrtle Rd., Sheffield S2 3HQ, UK. www.novacon.org.uk.** Quality, Walsall UK. Major UK con.

8—**ConCept, Box 1186, Montreal QB H2X 4A7. www.monsffa.com/concept2003. cathypl@sympatico.ca.**

14–16—**OryCon, Box 5464, Portland OR 97228. (503) 997-0731.** Doubletree Columbia River. N.K. Hoffman. Ken Goddard.

14–16—**AstronomiCon, Box 31701, Rochester NY 14603. (585) 342-4697.** Bob Eggleton, Dick & Leah Smith, R. Rogow.

14–16—**TusCon, Box 27307, Tucson AZ 85726. (520) 881-3709. basfa@earthlink.net.** Innsuites Hotel.

14–16—**VulKon, Box 297122, Pembroke Pines FL 33029. (954) 441-8735.** Wm. Shatner. Commercial Star Trek event.

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NEXT ISSUE

JANUARY ISSUE

Next issue, our January 2004 issue, marks the start of another great year of *Asimov's* stories. Coming up for you in the months ahead, we have terrific tales by **Allen M. Steele**, **James Patrick Kelly**, **Larry Niven**, **William Barton**, **Nancy Kress**, **Kage Baker**, **Charles Stross**, **Gene Wolfe**, **William Sanders**, **Brian Stableford**, **Kristine Kathryn Rusch**, **Robert Reed**, **Steven Popkes**, **Mike Resnick**, **Mary Rosenblum**, **R. Garcia y Robertson**, **Steven Utley**, **Kathleen Ann Goonan**, **Chris Beckett**, **Neal Asher**, **Tanith Lee**, **James Van Pelt**, **Tom Purdom**, **Gregory Feeley**, **Michael Jasper**, **Richard Parks**, **Nisi Shawl**, **Jack Skillingstead**, **Kit Reed**, **Phillip C. Jennings**, **Lois Tilton**, **Sarah A. Hoyt**, **Ian McDowell**, **R. Neube**, and many more . . . and that's just in the first few months of the year!

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OUR STELLAR CAST

Prolific British "hard science" writer **Brian Stableford** serves up our January cover story, taking us to a prosperous and civilized near-future that must deal with some unexpected shocks and surprises when a potent bottle of "Nectar" is uncorked; **Steven Popkes** then takes us to a future that is anything but prosperous and placid, as the few survivors of a shattered world struggle to *continue* to survive and hang on to the tattered remnants of civilization, aided and guided by the enigmatic figure of "This Old Man"; popular writer **Mary Rosenblum** launches us into space, where miners daring dangerous territory in the Asteroid Belt must face the subtler but even more terrible dangers of the "Songs the Sirens Sing"; Hugo-winner **Allen M. Steele** returns us to the newly settled frontier planet of Coyote, where a daring engineering project known as "The Garcia Narrows Bridge" becomes a battlefield in a deadly Civil War; new writer **Benjamin Rosenbaum**, making an evocative *Asimov's* debut, offers us a poignant look at the price of following your heart, in "Embracing-the-New"; and new writer **Michael Jasper** guides us back into the *past*, for the strange and vivid tale of the conflict between "Coal Ash and Sparrows."

EXCITING FEATURES

Robert Silverberg's "Reflections" column considers "Neque Illorium Ad Nos Pervenire Potest"; and **Paul Di Filippo** brings us "On Books"; plus an array of cartoons, poems, and other features. Look for our January issue on sale on your newsstand on November 18, 2003.

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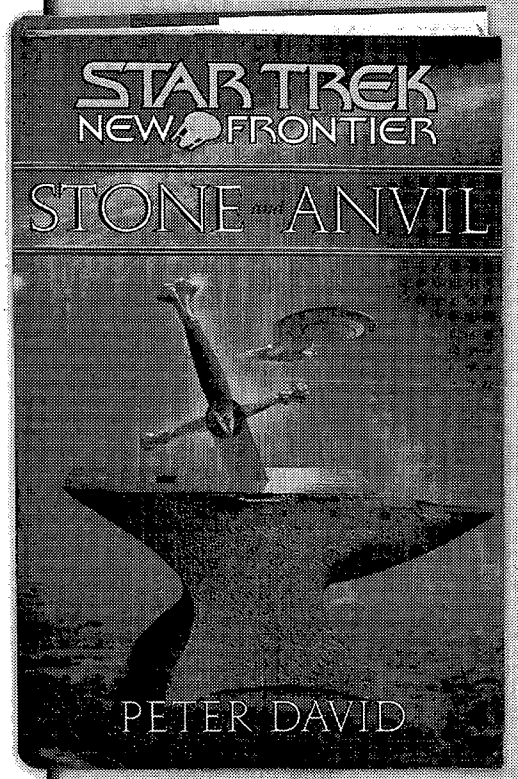

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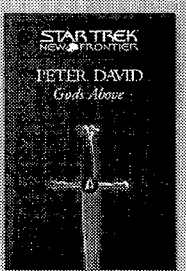

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